



Phase II Interpretative Ground Assessment

At

Chorlton Irish Club,
Cross Road,
Chorlton

Client: Southway Housing

Reference: 31296-SUT-ZZ-00-RP-G-702-0002

Date: June 2021

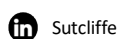
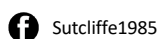
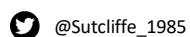
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SUTCLIFFE INVESTIGATIONS

Phase II Interpretative Ground Assessment

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FOREWORD (Geotechnical and Environmental Assessment)

This report has been prepared for the sole internal use and reliance of the Client named on page 1. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Sutcliffe Investigation; such authorisation not to be unreasonably withheld. If any unauthorised third party comes into possession of this report, they rely on it at their risk and the authors owe them no duty of care and skill.

The report presents observations and factual data obtained during our site investigation and provides an assessment of Geotechnical and environmental issues with respect to information provided by the Client regarding the proposed development. Further advice should be sought from Sutcliffe Investigation prior to significant revision of the development proposals. Primary aims of this exploratory phase of investigation were to identify salient geotechnical and environmental issues affecting the site to enable the client to obtain budget costs for the necessary site preparatory and remedial works.

The report should be read in its entirety, including all associated drawings and appendices. Sutcliffe Investigation cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

The findings and opinions conveyed in this report (including review of any third-party reports) are based on information obtained from a variety of sources as detailed within this report, and which Sutcliffe Investigation believes are reliable. All reasonable care and skill have been applied in examining the information obtained. Nevertheless, Sutcliffe Investigation cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

The report represents the findings and opinions of experienced Geotechnical and environmental consultants. Sutcliffe Investigations does not provide legal advice and the advice of lawyers may also be required.

Intrusive investigation can only investigate shallow ground beneath a small proportion of the total site area. It is possible therefore that the intrusive investigation undertaken by Sutcliffe Investigation, whilst fully appropriate, may not have encountered all significant subsurface conditions. Any opinions expressed as to the possible configuration of strata between, or below exploratory holes are for guidance only and no responsibility is accepted as to its accuracy.

It should be borne in mind that the timescale over which the investigation was undertaken might not allow the establishment of equilibrium groundwater levels. Particularly relevant in this context is that groundwater levels are susceptible to seasonal and other variations and may be higher during the wetter periods than those encountered during this commission.

Where the report refers to the potential presence of invasive weeds such as Japanese Knotweed, or the presence of asbestos containing materials, it should be noted that the observations are for information only and should be verified by a suitably qualified expert.

This report assumes that ground levels will not change significantly from those existing at present. If this is not to be the case, then some modification to this report may be required.

It should be noted that the banning of the co-disposal of hazardous and non-hazardous waste was introduced in 2011, as a result of the implementation within the UK of the Landfill Directive. This will considerably affect the current practices and procedures for the handling and disposal of wastes, in particular hazardous wastes. In addition, it will be a requirement for all wastes to be pre-treated and to comply with certain waste acceptance procedures prior to sending wastes to landfill. The full potential effects of these important changes are not known at this stage, but it is perceived that disposal costs will rise, particularly for hazardous wastes, and waste pre-treatment may, in some cases, become an 'additional' redevelopment cost with regard to the remediation of contaminated sites.

Should this report recommend that materials could be excavated and removed off site for landfill disposal, then it should be noted that the costs, timescales and implications of the pending changes to waste management legislation couldn't be predicted at this stage. Sutcliffe Investigation will not be responsible for changing practices, etc that may affect the viability of necessary remedial actions or of the implications of potential alternative treatment techniques.

Sutcliffe Investigation reserves the right to amend their conclusions and recommendations in the light of further information that may become available. General notes and limitations relevant to all Sutcliffe Investigations are described in the Foreword and should be read in conjunction with this report.

Executive Summary

INTRODUCTION	Sutcliffe Investigations was instructed by Southway Housing to undertake a Phase II ground assessment for the site at Cross Road, Chorlton-cum-Hardy, Manchester, M21 9DJ. The site is centred on National Grid Reference (NGR) 381721, 393651 and is approximately 0.29ha in area. This report assesses the ground based geotechnical and environmental risks, constraints and liabilities associated with the proposed development of the site. This is required in support of the discharge of contaminated land planning conditions assigned to the site and to allow the design of economic foundation solutions.
SITE DESCRIPTION	The site is L-shaped, 0.29ha and can be accessed via Cross Road to the east of the site and High Lane to the north of the site. The site comprises a narrow rectangular area where the existing building is situated along with a large open area of hardstanding that has been used as a car park and a small fenced off area comprising artificial grass.
DEVELOPMENT PROPOSAL	The proposed layout is for the construction of a residential apartment block with associated car parking and infrastructure.
PRELIMINARY CONCEPTUAL MODEL	The earliest available historical map indicated that the site was comprised of field land. By 1881 a Masonic Hall and a bowling green were noted on the northern and southern sections of the site respectively. A pavilion was noted on site by 1933 but later demolished between 1971 and 1974, during this time the building on site was relabelled 'Irish Association Social Club'. With the exception of the date the car park was made being unknown, the site remained relatively unchanged until present day. The potential for significant contamination to have arisen at the site as a result of the current and former usage on site is considered to be low to moderate. Potential contaminants associated with such activities may comprise a wide range of metals, fuels, oils, acids, alkalis and asbestos.
PREVIOUS WORKS	Groundtech Consulting have completed a Phase I Desk Study, a synopsis of which is provided in Section 2 of this report. No other previous studies are known to have been undertaken to Sutcliffe's knowledge.
SITE INVESTIGATION	Site work was undertaken on 17th May 2021 and consisted of:  4No. Window Sample Holes.  1No. Cable Percussion Boreholes  2No. Trial Pits Contamination samples were taken from various depth within the made ground.
GROUND CONDITIONS	Made Ground: Made ground was encountered in all of the exploratory holes across the site and was noted to a maximum depth of 0.8m in TP101 and TP102. Made ground generally consisted of tarmac at the surface over a dark brown, gravelly, fine-coarse, sandy gravel of tarmac. This lay above a dark brown, gravelly, fine to coarse sand with fragments of tarmac, brick, and occasional ceramic. Natural Ground: Natural ground was encountered in all boreholes and trial pits and generally consisted of light brown, slightly gravelly, fine-coarse SAND. The gravel was fine-medium sub-rounded to rounded of sandstone and other mixed lithologies. Brown, firm-stiff, sandy clays were encountered between 3.3-3.7m in WS101, WS102 and WS104.
GROUNDWATER	Groundwater was recorded in WS102 at 3.00m, WS103 at 3.00m and BH101 at 0.7m during the site investigation work.

ENVIRONMENTAL RISK ASSESSMENT	Long Term Human Health Elevated levels of Arsenic, Lead, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(ah)anthracene all indicate the presence of site wide contamination that will require remediation to be safe for Human Health. This will require the removal of material from site and the importing of clean tested material to create a capping break layer in garden areas on site, with hardcover providing a break layer in other areas of the site. It is also noted that one sample identified Asbestos fibres and that further delineation is recommended to ascertain the extent of asbestos contamination in this area and to provide more detailed information on the potential human health risk to construction workers from this material. Controlled Waters Risk Assessment For controlled waters there are two assessment criteria, the Environmental Quality Standard (EQS) and the UK Drinking Water Standard (UKDWS). The EQS assessment values identified two out of the three samples within the EQS range, with the third sample being elevated above this range. The sample from WS4 0.50-0.80m is elevated above the EQS assessment value for Fluoranthene, Benzo(b)fluoranthene, Benzo(k)fluoranthene and Benzo(ghi)perylene. The levels recorded would classify these contaminants as a low risk to controlled waters. One sample of Benzo(a)pyrene, (WS4 0.50-0.80m) was noted elevated above the UKDWS assessment value; again, due to the level of contamination recorded we would classify this as a low risk to drinking waters.
ASBESTOS	No asbestos fibres were identified within the exploratory holes and therefore no asbestos remediation is required.
RADON	The site is not in a Radon Affected Area, as <1% of properties are above the Action Level. No radon protective measures are necessary.
GEOTECHNICAL ASSESSMENT	General - It is understood that consideration is being given to the development of a residential apartment block with associated car parking and infrastructure. Due to the ground conditions encountered it would be Sutcliffe's recommendation that a concrete strip footing foundation solution is adopted, with allowance for a bearing pressure of 100kN/m². Groundwater was recorded in WS102 at 3.00m, WS103 at 3.00m and BH101 at 0.70m during site investigation works. Sub-surface concrete that is only in contact with Made Ground can be Design Sulphate Class DS-1, with an ACEC Classification of AC-1s. Ground Floor Construction - Based upon the amount of Made Ground noted on site it is not recommended that a ground-bearing slab is utilised on site. Sutcliffe Investigations therefore propose a suspended P.C Unit ground floor be adopted. Geotechnical Uncertainty - The site has been subject to previous development and therefore, the potential for relic foundations and obstructions cannot be discounted.
WASTE CLASSIFICATION	A preliminary waste classification was carried out to determine the classification of soil contamination data using HazWasteOnline program, which creates the standard 'Hazardous / Non-Hazardous' classification of soils. The Waste Classification Report states that soils sampled at WS101 (0.30-0.50m bgl), WS102 (0.10-0.30m bgl) and WS104 (0.30-0.70m bgl) are classified as 'Hazardous Waste' due to the exceedance of Total TPH (C6 to C40) at 1460mg/kg, 1140mg/kg and 1040mg/kg, respectively. All remaining soils analysed are classified as 'Non-Hazardous' waste. Notwithstanding, the final decision on waste classification is determined by the accepting landfill, and consultation with landfill operators be carried out during the development of the SMMP.

RECOMMENDATIONS	The following actions are recommended: - Design a Phase III Remediation & Validation Proposal for submission to planning department. - Design SMMP – management of material on and off site. - Good hygiene practices should be employed during construction work, in addition, the findings of this investigation should be included within the contractors H&S file and an assessment of risks associated with short term human health completed. No consumption of food or smoking should occur without prior hand washing. If dust is encountered, dust masks should be worn, and dust suppression employed.
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NOTE: The executive summary is an overview of the key findings and conclusions of the report. There may be other information contained in the body of the main report which puts into context the information presented within the executive summary. No reliance should be placed on the executive summary.

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1 Introduction

1.1 Terms of Reference

Sutcliffe Investigations was instructed by Southway Housing Trust (*the “client”*) to undertake a Phase II ground assessment for the site at Cross Road located in Chorlton-cum-Hardy, Manchester, M21 9DJ.

The location of the site is presented as *Figure 1*. The site is centred on National Grid Reference (NGR) 381721, 393651 and is approximately 0.29ha in area. An aerial photograph of the site is presented as *Figure 2*.

A plan detailing the sites existing site layout is presented as *Drawing No: 31296-SUT-ZZ-00-DR-G-720-0001*.

This report assesses the ground based geotechnical and environmental risks, constraints and liabilities associated with the proposed development of the site. This is required in support of the discharge of contaminated land planning conditions assigned to the site and to allow the design of economic foundation solutions.

1.2 Development Proposal & Legislative Context

Development Proposal

The proposed layout is shown in View Associates Limited *Drawing “Proposed Site Plan”*. This report has been prepared in support of a planning application to develop the site for the construction of a residential apartment block with associated car parking and infrastructure.

Legislative Context

The presence of contaminants which may pose a risk to human health or the environment, is a material planning consideration. For planning it should be considered whether the site is suitable for its new use, and the responsibility for securing a safe development (including cumulative effects of pollution on health, and the potential sensitivity of the proposed development to adverse effects from pollution,) rests with the developer and/or landowner. Planning is concerned with the site’s proposed use not its current use, where the amount of contamination is expected to be low relative to the level of risk. This is the opposite to Part 2A which considers high levels (significant harm) and the current use of the site.

Section 57 of the Environment Act 1995 adds Part 2A (ss.78A-18YC) to the Environmental Protection Act 1990 and contains the legislative framework for identifying and dealing with contaminated land. Where development is undertaken on land which may be affected by contamination, the National Planning Policy Framework, paragraph 120 to 122 considers pollution and remediation. This links the contaminated land regime within the development process.

For there to be an environmental liability associated with the site there must be a perceived source (a contaminant), a receptor (humans, living organisms or property) and

a pathway between them. The potential presence of all of these aspects would result in a complete contaminant linkage.

In accordance with environmental legislation and the associated guidelines, assuming the site is to be redeveloped as housing, it should be noted that any redevelopment of the site could actually create new pathways that could increase the liabilities associated with the site. In addition, the basis of the intrusive ground assessment is to refine the preliminary conceptual model.

1.3 Site Location and Setting

The site is located at Cross Road, Chorlton-cum-Hardy, Manchester, M21 9DJ at National Grid Reference (NGR) 381721, 393651 (*Figure 1*), within a predominantly residential area with local amenities also noted in the area.

A location plan and aerial photograph of the site are shown as *Figure 1 & 2*.

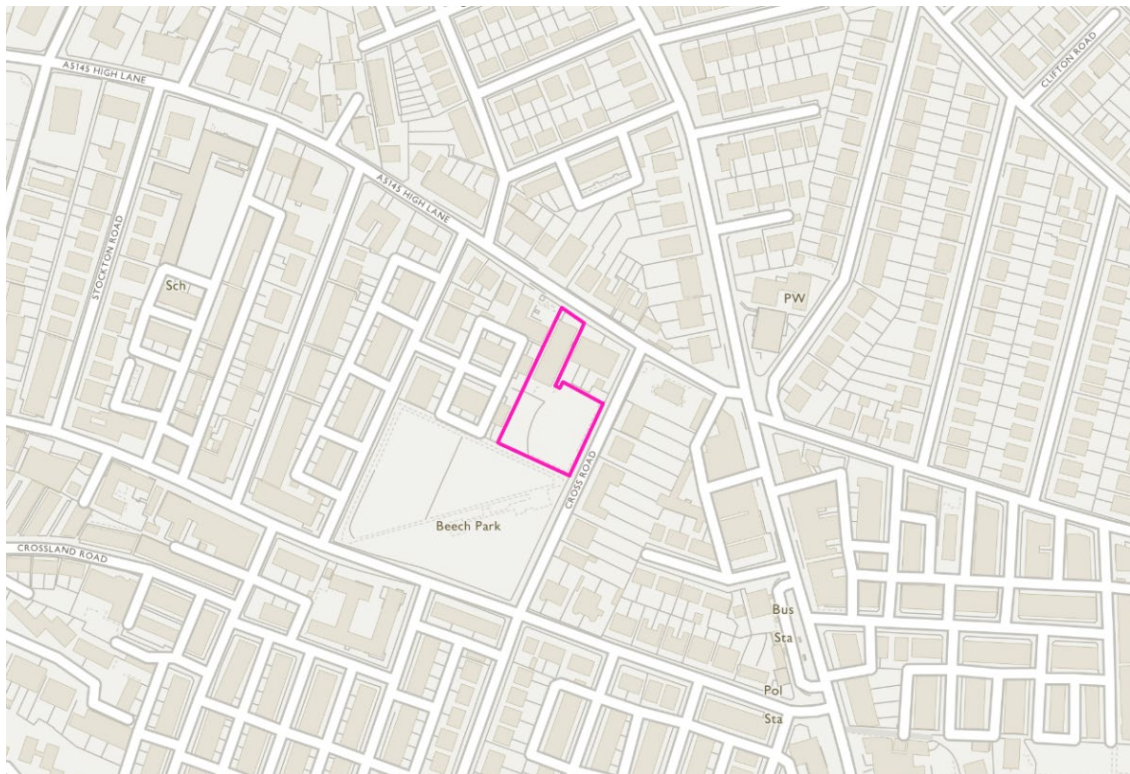


Figure 1: General Location of Site

1.4 Site Description and Layout

The site is L-shaped, 0.29ha and can be accessed via Cross Road to the east and High Lane to the north of the site. The site comprises a narrow rectangular area where the existing building is situated along with a large open area of hardstanding that has been used as a car park and a small fenced off area comprising artificial grass.



Figure 2: Aerial Photograph of the Site

1.5 Previous Studies

Groundtech Consulting have completed a Phase I Preliminary Risk Assessment (PRA). (Report Reference: GRO-20215-1793), a synopsis of which is provided in Section 2 of this report. The previous report made the following conclusions:

-  Shallow spread foundations cast in the sand and gravel may be an option. Depending on the depth of the made ground encountered. Alternatively, a deeper foundation solution may be more cost beneficial.
-  Soil percolation testing may be a viable option if a sufficient depth of Sand and Gravel deposits is present as these strata often provides good drainage properties.
-  An Asbestos Demolition Survey should be undertaken prior to demolition or refurbishment of any of the existing buildings on site.
-  The following scope of works were recommended based on the Preliminary CSM compiled:
 -  1No. Cable Percussive borehole,
 -  5No. Windowless Sample boreholes,
 -  1No. Hand Excavated Trial Pit,
 -  Geo-environmental Testing,
 -  Geotechnical Testing.

No other previous studies are known to have been undertaken to Sutcliffe's knowledge.

1.6 Objectives & Scope of Assessment

The aim of the intrusive ground investigation is to identify potential geotechnical & environmental liabilities and constraints, associated with the development of the site area in support of the following:

-  A planning application and the discharge of contaminated land conditions where reasonably practicable that may have been assigned to the site and to include the design of a remediation scheme, if required as part of the National Planning Policy Framework (NPPF).
-  To assess the likelihood of reuse of materials that are site won or disposal options for surplus material.
-  The preliminary design of detailed and economic foundations options inclusive of all information and specifications relating to foundation types, the location of underlying rock, (if encountered), preparation of ground, concrete grades, reuse of materials for both the proposed building, and the existing foundations.

2 Preliminary Conceptual Risk Assessment

2.1 Introduction

The Phase I PRA completed by Sutcliffe is summarised below. This report should be read in conjunction with Report Ref: *Phase I Preliminary Risk Assessment, Cross Road, Chorlton, Ref: GRO-20215-1793*.

2.2 Site History

The earliest available historical map indicated that the site was comprised of field land. By 1881 a Masonic Hall and a bowling green were noted on the northern and southern sections of the site, respectively. A pavilion was noted on site by 1933 but later demolished between 1971 and 1974, during this time the building on site was relabelled 'Irish Association Social Club'.

Except for the date the car park was made being unknown, the site remained relatively unchanged until present day.

The potential for significant contamination to have arisen at the site as a result of the current and former usage on site is considered to be low to moderate. Potential contaminants associated with such activities may comprise a wide range of metals, fuels, oils, acids, alkalis and asbestos.

It is proposed to develop the site with houses with associated infrastructure and garden areas.

2.3 Geotechnical Constraints

Coal Mining

The site is not within a coal mining area.

Geology

No artificial ground or faults are noted on site.

Historical Land Use

Made ground may be present in the vicinity of the previous bowling green noted on site.

2.4 Potential Contaminant Linkages

Sources

The likely contaminants from made ground associated with former site usage, infilling activity which may be present on site could include heavy metals such as cadmium, chromium, copper, lead, nickel and zinc, asbestos, hydrocarbons and organic compounds such as Polycyclic Aromatic Hydrocarbons (PAHs). Furthermore, ground gases such as methane and carbon dioxide may be generated from areas of made ground material.

No off-site sources have been identified that would represent a significant risk to the site.

The likely contaminants from previous land uses are shown below in *Table 2.1*.

Table 2.1: Potential Source(s) of contamination

Reference	Potential Sources (On-site)	Potential Contaminants
S1	Made Ground	All metals, fuel, hydrocarbons and oils.

Receptors

The most sensitive receptors identified using the conceptual site model are considered to be site and adjacent site users, construction and maintenance workers, controlled waters (Principal Aquifer and Secondary A Aquifer) infrastructure and buried services. These are most likely to be affected by made ground and any associated contaminants and gas generated from made ground, if present on site.

Human receptors would comprise construction workers, future site users and adjacent site users. It is likely that the exposure to contamination by construction workers will be limited due to the short exposure to the potential contamination and the use of PPE. If ground gases are produced this could be a potential risk to the future site users and properties and workers in confined spaces / trenches etc.

Due to the potential for contaminants to be present on site there is the potential for contaminants to leach and migrate to the underlying Principal Aquifer. Drift material is noted to be present under the site and is classified as a Secondary A Aquifer which will act as an aquiclude, reducing the risk to the underlying aquifer. *Table 2.2* below details the potential receptors.

Table 2.2: Receptors

Ref	Receptor	Description
R1	Current & future site users	Site users; personnel, general workers and maintenance workers,
R2	Construction Workers	Contractors working on the development of the site. Construction workers, maintenance workers or other personnel who may be directly exposed to contaminated materials in the course of their activities).
R3	Controlled Waters	Principal Aquifer and Secondary A Aquifer and on-site drainage
R4	Adjacent Site Users	Adjacent site users. Third-party land (<i>i.e.</i> the possibility of contamination migrating off-site onto third party land <i>via</i> contaminated groundwater, surface water run-off).
R5	Infrastructure / Buried services	Proposed buildings and buried services

Pathways creating contaminant linkages

Table 2.3: Pathways

Ref	Pathway	Description
P1	Direct contact with potential contaminants.	Dermal absorption, ingestion and inhalation of contaminants via direct contact.
P2	Ingestion of potential contaminants.	Construction workers may come into contact during the site works; however, this will be for a short time and therefore limited exposure will occur. PPE can be used. Construction workers may come into contact during the site works, however this will be for a short time and therefore limited exposure will occur. PPE can be used and worn as a precaution to reduce the risk.
P3	Inhalation of potential contaminants.	
P4	Leaching and migration of contaminants.	Leaching of possible contaminants could migrate into the underlying Secondary A Aquifer and Principal Aquifer via shallow groundwater. On site drainage is also at risk from shallow contamination, if present.
P5	Vertical and lateral migration of ground gases / vapours.	There is the potential for contaminants to be present on the site, which could generate ground gas & vapours on site.

2.5 Risk Evaluation

An evaluation of the risk that each contaminant linkage poses to the project (as identified in the *Section 2*) has been undertaken, in general accordance with CIRIA guidance document C552, 2001 (as detailed in *Appendix B*) and summarised in *Tables 2.4* and *2.5* below.

Table 2.4: Classification of probability

Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage, and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the shorter term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the very long term.

Table 2.5: Comparison of consequence against probability

Consequence					
Severe	Medium	Mild	Minor		
Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk	High Likelihood	Probability
High Risk	Moderate Risk	Moderate / Low Risk	Low Risk	Likely	
Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk	Low Likelihood	
Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk	Unlikely	

Each potential contaminant linkage is identified in *Table 2.6* below.

The evaluation and the resultant actions identified are based on the available information presented within this report. A visual representation of the Preliminary CSM is presented as *Figure 3*.

The evaluation and resultant actions identified are based on available information presented within the Phase I PRA (*Report reference: GRO-20215-1793*)

During the development there is a potential for short term human health risk to construction workers. These should be assessed and anticipated by the contractor under CDM Regulations 2015.

Table 2.6: Preliminary Risk Evaluation of Potential Contaminant Linkages

1. Hazard Identification		2. Hazard Assessment				3. Risk Estimation		4. Risk Evaluation	5. Managing the Risk
Contaminant Source		Pathway		Receptor		Consequence of risk being realised	Probability of risk being realised	Classification	Action required
S1	Potentially contaminated soil on Site	P1	Dermal contact	R1/2	Site users	Medium	Low Likelihood	Moderate / Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard. Investigation is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
		P2	Ingestion of soil / soil dust	R1/2	Site users	Medium	Low Likelihood	Moderate / Low Risk	
		P3	Inhalation of vapours / soil gas	R1/2	Site users	Severe	Unlikely	Moderate / Low Risk	
		P4	Leaching and migration of contaminants	R3/5	Principal aquifer/ Secondary A Aquifer	Medium	Low Likelihood	Moderate / Low Risk	
		P5	Lateral migration of soil gas / vapours	R1	Site users	Severe	Unlikely	Moderate / Low Risk	
				R4	Property	Severe	Unlikely	Moderate / Low Risk	

3 Ground Investigation

3.1 Design Rationale

The aim and design of the ground assessment is to satisfy planning conditions assigned to the site by reference to the National Planning Policy Framework (NPPF). This will identify elevated concentrations of determinands with the aim of assessing long term human health risks to site users and groundwater resources. In addition, the works have been designed to allow the design of economic foundation solutions for the proposed new builds.

3.2 Fieldwork

Field works were undertaken on 17th May 2021 by VC Drilling, a specialist ground investigation contractor. All works were supervised by a suitably qualified Sutcliffe engineer. The investigation was carried out in general accordance with the following standards:

-  *BS10175:2011+A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice;*
-  *R&D Technical Report P5-066/TR Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination, 2001 (Environment Agency).*
-  *BS 5930:2015 Code of practice for site investigations; and,*
-  *BS EN ISO 22475-1:2006 Geotechnical investigation and testing. Sampling methods and groundwater measurements. Technical principles for execution.*

Window sample, trial pit and cable percussive logs collated as part of the ground investigation completed by Sutcliffe's are presented in *Appendix C*.

3.3 Health & Safety

Service plans for the development site have been obtained and are included as part of the Phase I PRA. Copies of these plans are maintained on site by the Sutcliffe engineer who is also responsible for clearing the areas to be investigated by use of a Cable Avoidance Tool (CAT) and signal generator (Genny).

3.4 Sampling Strategy

Due to the history of the site, with limited development having occurred, a non-targeted sampling strategy was used to obtain a site wide representation of the site and the potential contamination issues.

The site area is $2,900\text{m}^2 \div 6 \text{ sample positions} = 483.33\text{m}^2 \div 0.8 = 604.17$

$\sqrt{604.17\text{m}^2} = \text{a } 24.58\text{m grid.}$

Therefore, this gives an 80% probability of finding a circular area of interest of 604.17m^2 .

A summary of exploratory hole detailing rationale is shown in *Table 3.1* below.

Table 3.1: Summary of Site Activities

Exploratory Hole ID	Location Rationale	Method	Completed Depth (mbgl)	Installation Details	Testing & Sampling details
WS101	General Site Coverage (HH)	Window Sampler	5.45	No installation	SPTs and environmental samples
WS102	General Site Coverage (HH)	Window Sampler	5.00	No installation	SPTs, environmental and bulk samples
WS103	General Site Coverage (HH)	Window Sampler	4.45	No installation	SPTs, environmental samples
WS104	General Site Coverage (HH)	Window Sampler	5.45	No installation	SPTs, environmental and bulk samples
TP101	General Site Coverage (HH)	Trial Pit	1.60	No installation	Environmental samples
TP102	General Site Coverage (HH)	Trial Pit	1.70	No installation	Environmental samples
BH101	General Site Coverage	Cable Percussion	13.95	No installation	SPTs

GG – Ground Gas / CW – Controlled Water / HH – Human Health

A plan detailing the position of sampling locations on an existing layout of the site is presented as *Drawing No 31296-SUT-ZZ-00-DR-G-720-0001*

3.5 Chemical Laboratory Testing

Selected soil samples (made ground) were collected at various depths and horizons and submitted for chemical analysis, details of which are presented in *Table 3.2*.

Table 3.2: Summary of Soils Analysis (Total & Leachate Concentrations)

Suite Reference	Analysis Suite
Soils Suite – total	<i>Metals suite, speciated (16) polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons according to the Total Petroleum Hydrocarbon Working Group (TPHCWG), asbestos screen, total cyanide, phenols and soil organic matter.</i>

All samples were stored in airtight containers appropriately labelled and transported in cool boxes with icepacks maintained at 4°C, under completed chain of custody documentation to Envirolab laboratories. Sample receipts as received from the laboratory are presented in *Appendix D*.

All samples were analysed by MCERTS accredited soil analysis laboratory Envirolab under UKAS accredited methods. All samples have been taken in accordance with current British Standards.

Envirolab are appropriately accredited for the works required and are an approved supplier under the Sutcliffe's Quality Management System.

Analytical test certificates are presented in *Appendix D*.

TPH Speciated aromatic and aliphatic bands with BTEX analysis have been carried out in line with the TPHCWG. The toxicity and migration risk associated with a TPH is dependent on the specific aliphatic aromatic carbon banding. Of particular concern are the low molecular weight compounds, which are highly mobile and show a greater level of toxicity than the higher molecular weight compounds. Therefore, a low TPH consisting of low molecular weight aliphatic and aromatic carbon banding compounds may present more of a risk than a high TPH consisting of heavy weight aliphatic and aromatic carbon banding compounds.

Based on the TPHCWG the aromatic band C5 – C7 is considered to consist only of Benzene and the aromatic band C7 – C8 of Toluene. Therefore, the more specific BTEX analysis has been used for risk assessment rather than the aromatic bands.

3.6 Drainage

It is recommended that the client / developer contact United Utilities with respect to capacity in existing foul and surface water sewers in the vicinity of the development area.

3.7 Water Supply

Please note the testing suite carried out for this site is for human health purposes and may not cover the suite of contaminants required by United Utilities for pipe selection and therefore further testing may be required.

3.8 Services

It is recommended that the client / developer contact the relevant service provided to ascertain the requirements for power reinforcement and / or relocation / diversion of existing services.

4 Ground Model

4.1 General

The following section describes the ground conditions encountered during the intrusive ground assessment completed by Sutcliffe. The ground comprises between 0.00-0.80m of made ground overlying light brown, slightly to very gravelly, fine to coarse grained SAND as well as firm to very stiff, brown, slightly to very sandy gravelly CLAY.

A summary of the strata depths and thicknesses is detailed in Table 4.1.

Table 4.1: Ground Conditions Encountered

Strata	Depths encountered (mbgl)		Thickness (m)		
	Min	Max	Min	Max	Average
Made Ground	0.00	0.80	0.40	0.80	0.63
Light brown, slightly to very gravelly SAND. Gravel is subrounded of sandstone or natural stone.	0.40	4.30*	0.15	3.30	2.01*
Firm to stiff, brown, slightly sandy occasionally slightly silty CLAY.	3.50	5.00*	0.50	0.70	1.07*
Orangey brown, clayey, gravelly, slightly cobbly SAND. Gravel is subangular to subrounded of natural stone. ^A	2.50	3.30	0.80	0.80	0.80
Firm to very stiff, brown, slightly to very sandy, gravelly CLAY. Gravel is subrounded to rounded of natural stone.	3.30	13.95*	0.60	5.30	2.39*
Light brown, gravelly, wet SAND. Gravel is rounded of mixed lithology. ^B	4.00	4.40	0.40	0.40	0.40
Soft to firm, brown, occasionally slightly silty, occasionally sandy CLAY.	3.70	11.00	0.45	2.00	1.23

^A Only encountered at one location – WS102.

^B Only encountered at one location – WS102.

* Final Depth of Strata not proven, average thickness on identified ground.

4.2 Made Ground

The made ground comprises tarmac at ground level, dark brown / black, sandy, angular to subangular, fine to coarse grained GRAVEL of tarmac. There is also dark brown, occasionally slightly silty gravelly occasionally ashy, fine to coarse grained SAND. Gravel is fine to coarse grained, angular to subangular, of brick, tarmac, and

natural stone with occasionally cobbles of brick, fine to coarse clinker, glass and ceramic. WS103 notes greyish white, sandy, fine to coarse grained, subangular to subrounded GRAVEL of natural stone.

4.3 Natural Ground

The natural ground comprises light brown, slightly to very gravelly, fine to coarse grained SAND as well as firm to very stiff, brown, slightly to very sandy gravelly CLAY. Orangey brown, clayey gravelly slightly cobbly, fine to coarse grained SAND is noted in WS102. Also noted at WS102 is light brown, gravelly, fine to coarse grained, wet SAND.

The characteristic values for the natural ground are shown below in *Table 4.2 and Figure 4*.

Table 4.2: Material Properties NATURAL & UNKNOWN GROUND

Property	No. of Tests	Range	Average
SAND SPT N Values	16	8-18	11.81
CLAY SPT N Values	6	10-50	25.17
UNKNOWN GROUND SPT N Values	4	10-19	13.75

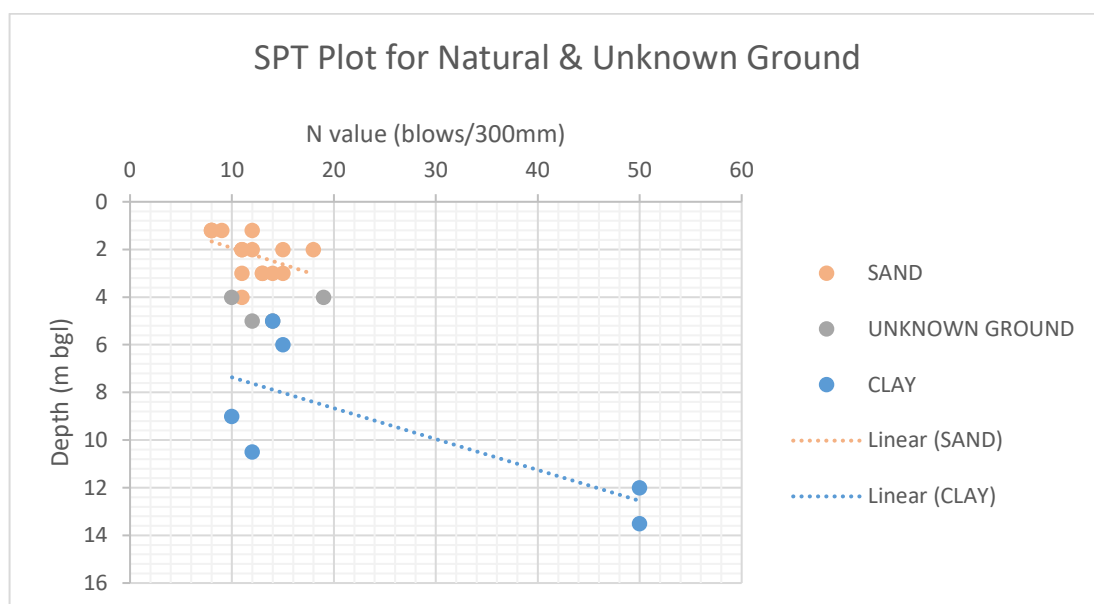


Figure 4: Material Properties NATURAL & UNKNOWN GROUND

4.4 Field Evidence of Contaminated Soils

There was no visual or olfactory evidence of contaminated soil on the site, beyond the identified made ground.

4.5 Groundwater

Groundwater was recorded in WS102 at 3.00m, WS103 at 3.00m and BH101 at 0.70m during site investigation works.

5 Geotechnical Laboratory Testing and Assessment

General

In total 1nr sample was recovered from site for the purpose of geotechnical laboratory testing from BH101 4.00m bgl. This U100 sample was scheduled for Triaxial testing.

However, due to the presence of voids and inclusions of sand and sandstone in the recovery, the sample was rendered untestable, and a Hand Shear Vane test was utilised to determine its strength.

Hand Shear Vane Testing

A single hand vane test was scheduled on 1nr sample recovered from site at BH101 at 4.00m bgl. The result of this testing is outlined below in *Table 5.1*.

Table 5.1: Hand Shear Vane Test Result

Borehole Number	Depth (m bgl)	Average Reading (kPa)
BH106	4.00	100

Stability

No evidence of instability was noted in the exploratory holes that were undertaken on site. However, it is noted that due to the amount of made ground noted on site, shoring would likely be required if any groundworks are to be left open during site works.

Soluble Sulphate and pH

It is envisaged foundations will extend through the Made Ground and into the natural strata and samples taken from the Made Ground have been submitted for pH and water-soluble sulphate (2:1 soil/water extract) analysis.

The highest water-soluble sulphate concentration and the lowest pH value for the Made Ground is shown in *Table 5.2*.

Table 5.2: Soluble sulphate and pH classification

Soil Type	Lowest pH Values	Highest Soluble Sulphate Concentration (g/l)
Made Ground	6.9	0.03

Therefore, in accordance with Table C2 of BRE: Special Digest 1 2005, sub-surface concrete that is in contact with Made Ground should be Design Sulphate Class **DS-1**, with the ACEC classification of **AC-1s**.

5.1 Foundation Recommendations

General

It is understood that consideration is being given to the development of a residential apartment block with associated car parking and infrastructure.

Due to the ground conditions encountered it would be Sutcliffe's recommendation that a concrete strip footing foundation solution is adopted on site. we would anticipate an allowable bearing pressure of 100kN/m².

Limited groundwater ingress was recorded during site investigation works.

Sub-surface concrete that is only in contact with Made Ground can be Design Sulphate Class DS-1, with an ACEC Classification of AC-1s.

Ground Floor Construction

Based upon the amount of Made Ground noted on site it is not recommended that a ground-bearing slab is utilised on site. Sutcliffe Investigations therefore propose a suspended P.C Unit ground floor be adopted.

Designated Concrete Mixes

The following designated mix in accordance with BRE Special Digest SD1 and BS 8500: Part1: 2015 will be suitable for use on this site.

Table 5.3: Designated Concrete Mixes

Application	DS-1 Conditions (Made Ground and Natural) ACEC Class AC-1s
Unreinforced strip / trench fill footings	GEN1
Reinforced strip / trench fill footing (mesh reinforcement)	RC30
Reinforced strip / trench fill footings (rebar etc)	RC30
Unreinforced concrete floor slabs	GEN2
In-situ reinforced concrete floor slabs	RC30

*Note: Although RC 30 is in line with BS8500, Sutcliffe Investigation recommend the use of RC35 for concrete used in structurally sensitive works, to provide greater certainty of compliance with strength verification tests. Tolerable mixes dispatched by a batching plant are +/- 10%, and delays on site can also result in deterioration of the concrete.

5.2 Geotechnical Uncertainty

The site has been subject to previous development and therefore, the potential for relic foundations and obstructions cannot be discounted.

6 Long Term Human Health Risk Assessment

6.1 Soils – Long Term Human Health

Methodology

Based on the Preliminary Risk Assessment and Ground Model for this site, a Generic Quantitative Risk Assessment for human health has been undertaken in accordance with CLR and SR (SC050021 series) (DEFRA) guidance as well as CL:AIRE guidance on Comparing Soil Contamination Data with a Critical Concentration, May 2008 and comprises the following:

-  *Selection of appropriate generic screening values for human health assessment.*
-  *Creation of relevant datasets from which to undertake the assessment.*
-  *Assessment of contamination distribution and comparison of site data to screening values using relevant statistical tests (in accordance with CIEH guidance).*
-  *Assessment of risks to receptors.*
-  *Determination of requirements for further investigation or remediation.*

Selection of Soil Screening Values

Soil screening values appropriate for a residential without plant uptake end use were selected.

Creation of Relevant Datasets

As part of the desk study assessment and Preliminary Conceptual Model, made ground was identified as the principal potential source identified for contamination in the risk evaluation (Section 2.0). Consequently, the sampling strategy targeted made ground encountered on site.

Assessment

The soil analytical data has been assessed following CL:AIRE / CIEH guidance, CLR11 Model Procedures Section 2.3, and NHBC R&D Publication 66 2008 “Guidance for the Safe Development of Housing on Land Affected by Contamination”.

The purpose of human health risk assessment for planning is to decide whether the land is suitable for the proposed end use and does not pose a risk to human health. Therefore, the key question to answer is, “Is there sufficient evidence that the true mean concentration is less than the critical concentration”?

Statistics are used to assist in answering the key question raised above and to help decide whether to support a particular hypothesis. The null hypothesis is the starting point because it is believed to be true but needs to be proved.

In terms of planning, the hypotheses are as follows:

 *Null Hypothesis (H0) - the true mean is equal to, or greater than the critical concentration.*

 *Alternative Hypothesis (H1) - the true mean is less than the critical concentration.*

The null hypothesis needs to be rejected in order to confirm that the land does not pose a human health risk and is suitable for use under the planning regime.

Identification of Contaminants of Concern

The results of the soil analysis from the investigation are shown in *Appendix G*. These results were then compared against the relevant GACs for 6% soil organic matter (SOM). The average percentage SOM was 8.63% for 6 samples.

Elevated levels of contamination were recorded in all samples taken from site when assessed against the *6% SOM Residential end use without plant uptake* values. These are recorded below in *Table 6.1*.

Table 6.1: Statistical Analysis Results for Made Ground Stratum Top 1.00m

Contaminant	Guideline Assessment Value	95% ile	Mean Value Test	Max Value Test	No. of Outliers removed to pass
Lead	310 (C4SL)	620.5580833	Inconclusive	1 Outlier	Passes with 1 Outlier removed
Naphthalene	13 (LQM 6%)	56.8325709	Fails	2 Outliers	Passes with 1 Outlier removed
Benzo(a)anthracene	15 (LQM 6%)	19.64678786	Inconclusive	1 Outlier	Passes with 1 Outlier removed
Chrysene	32 (LQM 6%)	34.5032253	Inconclusive	1 Outlier	Passes with 1 Outlier removed
Benzo(b)fluoranthene	4 (LQM 6%)	14.25750187	Fails	1 Outlier	N/A – Still fails with outlier removed
Benzo(a)pyrene	3.2 (LQM 6%)	12.97987598	Fails	No Outliers	N/A
Dibenzo(ah)anthracene	0.32 (LQM 6%)	1.178355642	Fails	No Outliers	N/A

LQM/CIEH S4ULs Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3104. All rights reserved.

There was one exceedance of the Lead screening value (WS103 0.25-0.70m bgl). When the Lead samples were processed through the statistical calculator, they are shown to be inconclusive with a 54% evidence level, with 1 outlier in the dataset. When this outlier is removed, Lead is then shown to pass the mean value test with

a 100% evidence level. This indicates that the identified Lead contamination surrounding WS103 poses a potential hotspot risk to long term human health.

There was one exceedance of the Naphthalene screening value (WS103 0.25-0.70m bgl). When the Naphthalene samples were processed through the statistical calculator, they are shown to fail with a 4% evidence level, with two outliers in the dataset. When the first outlier is removed, Naphthalene is then shown to pass the mean value test with a 100% evidence level. This indicates that the identified Naphthalene contamination surrounding WS103 poses a potential hotspot risk to long term human health.

There was one exceedance of the Benzo(a)anthracene screening value (WS103 0.25-0.70m bgl). When the Benzo(a)anthracene samples were processed through the statistical calculator, they are shown to be inconclusive with an 80% evidence level, with one outlier in the dataset. When this outlier is removed, Benzo(a)anthracene is then shown to pass the mean value test with a 99% evidence level. This indicates that the identified Benzo(a)anthracene contamination surrounding WS103 poses a potential hotspot risk to long term human health.

There was one exceedance of the Chrysene screening value (WS103 0.25-0.70m bgl). When the Chrysene samples were processed through the statistical calculator, they are shown to be inconclusive with a 94% evidence level, with one outlier in the dataset. When this outlier is removed, Chrysene is then shown to pass the mean value test with a 100% evidence level. This indicates that the identified Chrysene contamination surrounding WS103 poses a potential hotspot risk to long term human health.

There were four exceedances of the Benzo(b)fluoranthene screening value (WS101 0.30-0.50m bgl, WS103 0.25-0.70m bgl, WS104 0.30-0.70m bgl and TP102 0.20-0.50m bgl). When the Benzo(b)fluoranthene samples were processed through the statistical calculator, they are shown to fail with a 13% evidence level, with one outlier in the dataset. When this outlier is removed, Benzo(b)fluoranthene is shown to still fail the mean value test with a 24% evidence level. This indicates that the identified Benzo(b)fluoranthene contamination poses a potential site wide risk to long term human health.

There were five exceedances of the Benzo(a)pyrene and Dibenzo(ah)anthracene screening values, details of which are listed below:

 WS101 0.30-0.50m bgl

 WS103 0.25-0.70m bgl

 WS104 0.30-0.70m bgl

 TP101 0.20-0.40m bgl

 TP102 0.20-0.50m bgl

When the Benzo(a)pyrene samples were processed through the statistical calculator, they are shown to fail with an 8% evidence level, with no outliers in the

dataset. This indicates that the identified Benzo(a)pyrene contamination poses a potential site wide risk to long term human health.

When the Dibenzo(ah)anthracene samples were processed through the statistical calculator, they are shown to fail with an 8% evidence level, with no outliers in the dataset. This indicates that the identified Dibenzo(ah)anthracene contamination poses a potential site wide risk to long term human health.

It should be noted that the screening values for Aliphatics EC12-16, Aliphatics EC16-35 and Aliphatics EC35-44 are based upon the theoretical lower saturation limit for the compounds in question. The lower saturation limit has been used for these contaminants as the CLEA calculated SGV/GAC is greater than the lower saturation limit and vapour inhalation is an important contributor to exposure (SR4).

Soil screening tables are shown in *Appendix G*.

Asbestos

No asbestos fibres were identified within the exploratory holes and therefore no asbestos remediation is required.

Discussion

The statistical analysis indicates that the null hypothesis cannot be rejected for all the contaminants must be accepted for Lead, Naphthalene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(a)pyrene & Dibenzo(ah)anthracene. For all other contaminants, the alternative hypothesis can be accepted.

Conclusions

Currently the site does pose a risk to human health, and remediation works will be required as part of the development to ensure that the site is suitable for occupation and no longer poses a risk to human health.

Given the extent of the identified contamination a site wide strip will be required to a depth of 600mm, with a capping layer being placed in garden areas to bring site levels back up. It would be anticipated that the remainder of the site that is not formed of gardens/landscaping will be covered by hardstanding, this along with the capping system would provide a break layer to source pathway receptor linkages.

While localised contamination of Lead, Naphthalene, Benzo(a)anthracene and Chrysene has been identified this will be remediated as part of the wider site strip.

6.2 Radon

The site is not within a radon affected area, as <1% of homes are above the action level. No radon protection measures are necessary in the construction of new dwellings or extensions.

7 Land Contamination Risks and Remediation Requirements

7.1 Revised Conceptual Model

Based on the findings of the human health, the preliminary conceptual model has been revised and finalised as shown in *Figure 5*. The drawing shows all contaminant linkages from the preliminary conceptual model, identifying those which remain relevant.

7.2 Remaining Potential Contaminant Linkages

Long Term Human Health

Elevated levels of Lead, Naphthalene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(ah)anthracene all indicate the presence of site wide contamination.

Notwithstanding, the proposed development will provide full hardcover across the site. This will act as a break layer providing no pathway for these contaminants to impact human health; hence no remediation is required.

Construction workers may be exposed via dermal contact, ingestion and inhalation of soil / dust during the construction period. Adjacent site users may also be exposed to contaminated soils via inhalation of dust generated during the construction phase.

Table 7.1: Summary of Remaining Contaminant Linkages

1. Hazard Identification		2. Hazard Assessment				3. Risk Estimation		4. Risk Evaluation	5. Managing the Risk
Contaminant Source		Pathway		Receptor		Consequence of risk being realised	Probability of risk being realised	Classification	Action required
S1	Made Ground (On-site)	P1	Dermal contact	R1/2	Site users	Medium	Low Likelihood	Moderate / Low Risk	The proposed development will provide full hardcover across the site. This will act as a break layer providing no pathway for these contaminants to impact human health hence no remediation is required.
		P2	Ingestion of soil / soil dust	R1/2	Site users	Medium	Low Likelihood	Moderate / Low Risk	
		P3	Inhalation of vapours / soil gas	R1/2	Site users	Severe	Unlikely	Moderate / Low Risk	
		P4	Leaching and migration of contaminants	R3/5	Principal aquifer/ Secondary Aquifer A	Medium	Low Likelihood	Moderate / Low Risk	
		P5	Lateral migration of soil gas / vapours	R1	Site users	Severe	Unlikely	Moderate / Low Risk	
				R4	Property	Severe	Unlikely	Moderate / Low Risk	

8 Waste Classification

8.1 Preliminary Waste Classification

A preliminary waste classification was carried out to determine the classification of soil contamination data using HazWasteOnline program, which creates the standard 'Hazardous / Non-Hazardous' classification of soils.

The Waste Classification Report states that soils sampled at WS101 (0.30-0.50m bgl), WS102 (0.10-0.30m bgl) and WS104 (0.30-0.70m bgl) are classified as 'Hazardous Waste' due to the exceedance of Total TPH (C6 to C40) at 1460mg/kg, 1140mg/kg and 1040mg/kg, respectively.

All remaining soils analysed are classified as 'Non-Hazardous' waste.

The full Waste Classification Report is provided in Appendix H.

Notwithstanding, the final decision on waste classification is determined by the accepting landfill, and consultation with landfill operators be carried out during the development of the SMMP.

8.2 Asbestos

No asbestos fibres were identified within the samples analysed thus does not impact the final waste classification.

9 Recommendations

9.1 Further works

The following actions are recommended:

-  Design a Phase III Remediation & Validation Proposal for submission to planning department.
-  Design SMMP – management of material on and off site.
-  Good hygiene practices should be employed during construction work, in addition, the findings of this investigation should be included within the contractors H&S file and an assessment of risks associated with short term human health completed. No consumption of food or smoking should occur without prior hand washing. If dust is encountered, dust masks should be worn, and dust suppression employed.

10 References

BRE Special Digest (1991) 'Sulphate and acidic resistance of concrete in the ground' **363**

BRE Special Digest (2001) 'Aggressive Chemical Environment For Concrete (ACEC) Site Classification.

CIRIA (1995) Report 149. 'Protecting development from methane. Methane and associated Hazards to Construction.' London

CIRIA (2007) C665. 'Assessing risks posed by hazardous ground gases to buildings.' London

DETR/Partners in Technology (1997) Passive venting of soil gases beneath buildings research report-guide for design.

Department of the Environment. Transport and the Regions. *Environment Protection Act* (1990) Part IIA: Contaminated Land.

Environment Agency (2000) 'Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies For Land Contamination. Research and Development. Technical Report. P5-066/TR', Bristol.

Environment Agency (2002) 'Department for Environment, Food and Rural Affairs and The Environment Agency. Assessment Of Risks To Human Health From Land Contamination: An Overview Of The Development Of Soil Guideline Values And Related Research', Environment Agency, Bristol. CLR report No. 7.

Environment Agency (2002) 'Department for Environment, Food and Rural Affairs and The Environment Agency. 'Priority Contaminants For The Assessment Of Land', Environment Agency, Bristol. CLR report No. 8

Environment Agency (2002) 'Department for Environment, Food and Rural Affairs and The Environment Agency. The Contaminated Land Exposure Assessment (CLEA) Model: Technical Basis And Algorithms', Environment Agency, Bristol. CLR report No. 10

Appendix A – General Notes

Generic Notes – Sutcliffe Investigations

Environmental Setting

General

Third party information obtained from the British Geological Survey (BGS), the Coal Authority, the Local Authority etc is presented in the Correspondence Appendix of the Geoenvironmental Report.

Geology, Mining & Quarrying

In order to establish the geological setting of a site, Sutcliffe Investigations refer to BGS maps for the area and the relevant geological memoir.

A coal mining report is obtained from the Coal Authority. Further information is sourced from the Local Authority and by reference to current and historical OS plans.

Landfills

Sutcliffe Investigations obtain data from the Landmark Information Group, the Environment Agency and the Local Authority with respect to known areas of landfilling within 250m of the proposed development site. Reference is also made to historical OS plans, which are inspected for evidence of backfilled quarries, railway cuttings, colliery spoil tips etc.

Radon

Radon is a colourless, odourless gas, which is radioactive. It is formed in strata that contain uranium and radium (most notably granite) and can move through fissures eventually discharging to atmosphere, or the spaces under and within buildings. Where radon occurs in high concentrations, it can pose a risk to health.

In order to assess potential risks associated with radon gas, Sutcliffe Investigations refer to BRE Report BR211, 1999: *“Radon: guidance on protective measures for new dwellings”*.

BR211 provides a preliminary indication of the measures required for a particular site, but it is also often necessary to request a Stage 2 Protective Measures Site Report from the BGS.

The level of protection needed is site-specific and is determined by reference to the radon potential map for the area followed by a geological assessment of the site. This information is contained in the Annexes of BR211.

Annex A – derived from statistical analysis of radon measurements in existing houses carried out by the NRPB and grouped on 5km grid.

Annex B – based on an assessment of the same radon measurements grouped by geological units. The maps show the 5km grid squares underlain completely or in part, by geological units which potentially exceed the action levels for radon protective measures. The grid squares are coded according to highest potential within the square. In many cases the actual geological radon potential varies considerably within a grid square.

Sutcliffe Investigations adopt the following procedure when assessing risk associated with radon.

Firstly, Annex A maps are reviewed to see whether the site requires full, basic or no measures. If the site is in a dark brown square, full radon protection measures are required. If the site is in a light brown square, reference should be made to Annex B.

Secondly, Annex B maps are reviewed to see whether a further geological assessment is required which may result in upgrading the result from Annex A. If a site lies within a shaded square, it may require radon protection and Sutcliffe Investigations request a Stage 2 Protective Measures Site Report from the BGS.

If the site is in a square that is not coloured or shaded in either set of maps then no radon protection is needed and therefore a BGS Report is not normally necessary.

The BGS geological assessment involves checking whether the site is on or close to a geological unit that has statistically been found to have elevated radon potential. The geological assessment is based on either 1:50,000 or the 1:250,000 scale data. The search area specified as part of the request is increased by 50m in areas where 1:50,000 data is available and by 500m in areas with 1:250,000 scale data to allow for potential inaccuracies in the position of boundaries. The BGS report indicates the highest level of protection required within the search area and its buffer zone.

When requesting a BGS report, Sutcliffe Projects select the search radius carefully, since too large a search radius may result in the inclusion of areas underlain by geological units of a higher radon potential, thereby giving rise to recommending too high a level of protection.

The report also includes (where available), a list of the geological units included in the assessment. Sutcliffe Investigations check that these actually underlie the site, rather than the buffer zone only.

On the basis of radon measurements in dwellings and on their geological interpretation, the BGS report stipulates the level of protective measures required for the proposed development site, and this could be:

1. no measures
2. basic measures or
3. full measures

Details of these measures are provided in the Hazardous Gas section of this Geoenvironmental Report.

Hydrogeology

Sutcliffe Investigations obtain information from the Environment Agency (EA) and the Landmark Information Group with respect to:

- groundwater quality
- recorded pollution incidents
- licensed groundwater abstractions

Reference is also made to the EA document "Policy and Practice for the Protection of Groundwater" (1998) and the relevant Groundwater Vulnerability Map.

Bedrock and any overlying granular Drift deposits are classified by the EA.

Major aquifers: *"Highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public water supply and other purposes".*

Minor aquifers: *"Fractured or potentially fractured rocks which do not have a high primary permeability, or other formations or variable permeability. Although these aquifers will seldom produce large quantities of water for abstractions, they are important both for local supplies and in supplying base flow to rivers".*

Non-aquifers: *"Formations which are generally regarded as containing insignificant quantities of groundwater. However groundwater flow through such rocks, although imperceptible, does take place and needs to be considered in assessing the risk associated with persistent pollutants. Some non-aquifers can yield water in sufficient quantities for domestic use".*

Groundwater vulnerability is determined by 4 variables:

1. The presence and nature of overlying soil (the weathered zone affected by living organisms; soil in the UK can extend up to 2m in depth). Physical properties of the soil affect the downward passage of water and its ability to attenuate pollutants. The EA make reference to a three-fold classification of soil types:-
 - Soils of **low** leaching potential are defined as “soils in which the pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal, or they have the ability to attenuate diffuse pollutants”.
 - Soils of **intermediate** leaching potential are defined as “soils which have a moderate ability to attenuate diffuse source pollutants or in which it is possible that some non-absorbed diffuse source pollutants and liquid discharges could penetrate the soil layer”.
 - Soils of high leaching potential are defined as “soils with little ability to attenuate diffuse source pollutants and in which non-absorbed diffuse source pollutants and liquid discharges have the potential to move rapidly to underlying strata or to shallow groundwater”.

In urban areas and restored mineral workings the soil information is based on fewer observations than elsewhere. A worst-case vulnerability (H) is therefore assumed for these areas and for current mineral workings by the EA. All are given a designation of **HU** unless proved otherwise.
2. The presence and nature of Drift, which often overlies bedrock. Where Drift is of substantial thickness and low permeability, it can provide an effective barrier to surface pollutant migration. Permeability Drift is classified as a Minor Aquifer except where it is in probable hydraulic continuity with a Major Aquifer, where it is regarded as part of the Major Aquifer unless proven otherwise by site investigation.
3. The nature of the geological strata (bedrock). Rocks that contain groundwater in exploitable quantities are called aquifers.
4. The depth of the unsaturated zone; i.e. that part of the aquifer which lies above the water table.

The EA have also designated Source Protection Zones, which are based on proximity to a groundwater source (springs, wells and abstraction boreholes). The size of a Source Protection Zone may vary from tens to several thousand hectares.

Hydrology

Sutcliffe obtains information from the Environment Agency and the Landmark Information Group with respect to:

- Surface water quality
- Recorded pollution incidents
- Licensed abstractions (groundwater & surface waters)
- Licensed discharge consents
- Site susceptibility to flooding

The EA have set **water quality** targets for all rivers. These targets are known as River Quality Objectives (RQOs). The water quality scheme used to set RQO planning targets is known as the River Ecosystem scheme. The scheme comprises five classes (RE1 to RE5) which reflect the chemical quality requirements of communities of plants and animals occurring in our rivers.

General Quality Assessment (GQA) grades reflect actual water quality. They are based on the most recent analytical testing undertaken by the EA. There are six GQA grades (denoted A to F) defined by the concentrations of biochemical oxygen demand, total ammonia and dissolved oxygen.

The susceptibility of a site to **flooding** is assessed by reference to a Flood Map on the Environment Agency's website. These maps provide shows natural floodplains – areas potentially at risk of flooding if a river rises above its banks or high tides and stormy seas cause flooding in coastal areas.

There are different kinds of area shown on the Flood Map:

1. Dark blue areas could be flooded by the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year, or by a river by a flood that has a 1% (1 in 200) or greater chance of happening each year.
2. Light blue areas show the additional extend of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance or occurring each year.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

The maps also show all flood defences built in the last five years to protect against river floods with a 1% (1 in 100) chance of happening each year, or floods from the sea with a 0.5% (1 in 200) chance of happening each year, together with some, but not all, older defences and defences which protect against smaller floods.

The Agency's assessment of the likelihood of flooding from rivers and the sea at any location is based on the presence and effect of all flood defences, predicted flood levels and ground levels.

It should also be noted that as the floodplain shown is the 1 in 100 year (or 1 in 200 year as appropriate) areas outside this may be flooded by more extreme floods (e.g. the 1 in 1000 year flood). Also, parts of the areas shown at risk of flooding will be flooded by lesser floods (e.g. the 1 in 5 year flood). In some places due to the shape of the river valley the smaller floods will flood a very similar extent to larger floods but to a lesser depth.

If a site falls within a floodplain, it is recommended that a flood survey be undertaken by a specialist consultant who can advise on appropriate mitigating measures; i.e. raising slab levels, provision of storage etc.

COMAH & Explosive Sites

Sutcliffe Investigations obtain information from the Landmark Information Group with respect to COMAH or explosive sites within 1km of the proposed development site. Sutcliffe Investigations' report refers to any that are present and recommends that the Client seeks further advice from the HSE.

Areas around COMAH sites (chemical plants etc) are zoned with respect to the implementation of emergency plans. The HSE are a statutory consultee to the local planning authority for all COMAH sites. The COMAH site may have to revise its emergency action plan if development occurs. This might be quite straightforward or could entail significant expenditure. Consequently, the COMAH site may object to a proposed development (although it is the Local Authority who have final say and they are likely to place more weight on advice from the HSE).

Preliminary Conceptual Ground Model

The site's environmental setting (and proposed end use) is used by Sutcliffe Investigations to assess the significance of any contamination encountered during the subsequent ground investigation.

Generic Notes – Sutcliffe Geoenvironmental Investigations

2. Ground Investigation Fieldwork

General

Sutcliffe Ground Investigations are undertaken in accordance with current UK guidance including:

- BS5930:1999 “*Code of practice for site investigation*”
- BS10175:2001 “*Code of practice for the identification of potentially contaminated sites*”
- Contaminated Land Reports 1 to 6, most notably CLR Report No. 4 “*Sampling strategies for contaminated land*”
- “*Guidance on the protection soil sampling strategies for land contamination*” – EA R&D Technical report P5-066/TR (2001)
- AGS: 1996 “*Guide to the selection of Geotechnical Soil Laboratory Testing*”

Exploratory hole logs are represented in Appendices to this Geoenvironmental Report. These logs include details of the:

- Investigation technique adopted
- Samples taken
- Descriptions of the solid strata and any groundwater encountered
- Results of any insitu testing
- Any gas/groundwater monitoring well installed

Exploratory Hole Locations

Exploratory hole locations are selected by Sutcliffe Investigations, prior to commencement of fieldwork, to provide a representative view of the strata beneath the site and to target potential contaminant sources identified during the preliminary investigation (desk study). Additional exploratory locations are often determined by the site engineer in light of the ground conditions actually encountered; this enables better delineation of the depth and lateral extent of organic contamination, poor ground, relict structures etc.

Investigation Techniques

Ground conditions can be investigated by a number of techniques; the procedures used are in general accordance with BS5930: 1999 and BS1377: 1990. Techniques most commonly used by Sutcliffe Investigations include:

- Machine excavated trial pits, usually equipped with a backactor and a 0.6m wide bucket
- Cable percussive (Shell & Auger) boreholes, typically using 150mm diameter tools and casing
- Window or windowless sampling boreholes. Constraints associated with existing buildings, operations and underground service runs can render some sites partly or wholly inaccessible to a mechanical excavator. In such circumstances, window sampling is often the most appropriate technique. A window sampling drilling rig can be manoeuvred in areas of restricted access and results in minimal disturbance of the ground (a 150mm diameter tarmac/concrete core can be lifted and put to one side). However, it should be noted that window sampling allows only a limited inspection of the ground (especially made ground with a significant proportion of coarse material).
- Rotary percussive open-hole probeholes are typically drilled using a tricone rock roller bit with air as the flushing medium. Probeholes are generally lined through made ground with temporary steel casing to prevent hole collapse.

Where installed, gas/groundwater monitoring wells typically comprise a lower slotted section, surrounded by a filter pack of 10mm non-calcareous gravel and an upper plain section surrounded in part by a bentonite seal and in part by gravel or arisings. The top of the plain pipe is cut off below ground level and the monitoring well protected by a square, stopcock type manhole cover set in concrete, or the plain pipe is cut off just above ground level and the well protected by 100mm diameter steel borehole helmet set in concrete.

Monitoring well details, including the location of the response zone and bentonite seal are presented on the relevant exploratory hole logs.

Insitu Testing

Where relative densities of granular materials given on the trial pit and window sample logs are based on visual inspection only, they do not relate to any specific bearing capacities. However, wherever possible, Sutcliffe Investigations employ a mackintosh probe to assess relative density. Mackintosh probe results can be related to approximate allowable bearing capacities.

The relative densities of granular materials encountered in cable percussive boreholes are based on Standard Penetration Test (SPT) results. SPTs are carried out boreholes, in accordance with BS 1377 1990, Part 9 Section 3.3. Where full penetration (600mm) is not possible, N values are calculated by linear extrapolation and are shown on the logs as $N^* = x$.

The strength of cohesive deposits is determined using a hand shear vane.

Shear strength test results reported on trial pit logs are considered to be more reliable than those reported on window sample logs. Significant sample disturbance occurs during window sampling and consequently shear strength results on disturbed window samples are generally lower than results obtained during trial pitting, in-situ or in large excavated blocks.

Sampling

Representative soil/fill samples are taken at regular intervals from the exploratory holes to assist in description of the ground and to allow selected laboratory testing to be performed. The type of sample taken is dependent on the nature of the stratum and the purpose of the analysis.

Where the soils encountered contain a significant proportion of coarse grained material, truly representative samples are not typically obtained – only the finer fraction is placed in sample containers. However, a visual estimate of the amount of coarse material is made on site.

NB: Coarse constituents not sampled are defined as: coarse gravel, cobble and boulder (i.e. any 'particles' with an average diameter greater than 20mm).

Occasionally, unrepresentative 'spot' samples are also taken from some exploratory locations for contaminant analysis, typically where unusual, localised pockets of materials are encountered.

Samples of soil for chemical testing are placed into 1 litre plastic tubs prior to delivery to the selected laboratory. Samples of water are taken in one litre brown glass bottles and stored in cool boxes, at a temperature of approximately 4°C, until delivery to the selected laboratory. Soil/fill samples for organic analysis are also stored in cool boxes.

Groundwater

Where encountered during fieldwork, groundwater is recorded on exploratory hole logs. If monitoring wells are installed, groundwater levels are also recorded on one or more occasions after completion of the fieldwork.

It should be borne in mind that the rapid excavation rates used during a ground investigation may not allow the establishment of equilibrium water levels. Water levels are likely to fluctuate with season/rainfall and could be substantially higher at wetter times of the year than those found during this investigation.

Long term monitoring of standpipes or piezometers is always recommended if water levels are likely to have a significant effect on earthworks or foundation design.

Description of Strata

The soils encountered during an Sutcliffe's ground investigation are described (logged) in general accordance with BS 5930. The descriptions and depth of strata encountered are presented on the exploratory hole logs and summarised in the Ground Conditions section within the main body of text.

The materials encountered in the trial pits are logged, samples taken and tests performed on the in-situ materials in the excavation faces, to depths of up to 1.2m; below this depth these operations are conducted at the surface on disturbed samples recovered from the excavation.

Key to Exploratory Hole Logs

Keys to logs are presented in the Appendix(ces) containing the logs. These are two keys – Symbols and Legends and Terms and Definitions.

Health and Safety

All work was carried out in accordance with the procedures detailed in the DGEL Health and Safety Manual and SUKD health and Safety Procedures.

Generic Notes – Sutcliffe Geoenvironmental Investigations

3. Geotechnical Laboratory Tests

General

Soil Samples are delivered to the laboratory for testing along with a schedule of testing drawn up by Sutcliffe Investigations. All tests are carried out in accordance with BS 1377:1990.

The test results are presented as received in an Appendix to this Geoenvironmental Report.

The following laboratory testing are routinely carried out on a selection of samples:

- Atterberg limits & moisture contents
- Soluble sulphate & pH

The additional tests are typically only scheduled where significant earthworks regrade is anticipated:

- Grading
- Compaction tests
- Particle density

Atterberg Limits & Moisture Content

The Liquid and Plastic Limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average Plasticity Index (PI) for each “type” of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth. Sutcliffe Investigations typically only consider a soil to be shrinkable if the proportion finer than 63µm is > 35%.

PI results are compared against guidance given in the NHBC Standards, Chapter 4.2 (revised April 2003) which advocates the use of modified Plasticity Index (I'p) defined as:

$$I'p = Ip * (\% < 425\mu m / 100)$$

ie if PI is 30%, but the soil contains 80% < 425µm, then I'p = 30 * 80/100 = 24%

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425µm sieve is routinely reported by testing labs.

Sutcliffe Investigations apply engineering judgement where PI results are spread over a range of classifications. Consideration is given to:

- The average values for each particular soil type (ie differentiate between residual soil and alluvium)
- The number of results in each class and
- The actual values

Unless the judgement strongly indicates otherwise, Sutcliffe Investigations typically adopt a conservative approach and recommend assumption of the higher classification.

Soluble Sulphate and pH

Sulphates in soil and groundwater are the chemical agents most likely to attack sub-surface concrete, resulting in expansion and softening of the concrete to a mush. Another common cause of concrete deterioration is groundwater acidity.

The rate of chemical attack depends on the concentration of aggressive ions and their replenishment at the reaction surface. The rate of replenishment is related to the presence and mobility of groundwater.

Sutcliffe Investigations refer to BRE Special Digest 1 (SD1) "Concrete in aggressive ground. Part 1: Assessing the aggressive chemical environment" (2001). SD 1 provides definitions of:

- The nature of the site (Greenfield, brownfield or pyretic)
- The groundwater regime (static, mobile or highly mobile)
- The Design Sulphate Class (DC Class) and
- The Aggressive Chemical Environment for Concrete (ACEC Class)

Sutcliffe reports clearly state each of the above for the site being considered.

The concentrations of sulphate in aqueous soil/fill extracts are determined in the laboratory using the gravimetric method. The results are expressed in terms of SO_4 for direct comparison with BS 5328:1997. The pH value of each sample was determined by the electrometric method.

SD1 also discusses determination of "representative" sulphate concentration from a number of tests. Essentially if <10 samples of a given soil-type have been tested, the highest measured sulphate concentration should be taken. If >10 samples have been tested, the mean of the highest 20% of the sulphate test can be taken. With respect to groundwater, the highest sulphate concentration should always be taken.

With respect to pH (soil & groundwater) the value used is the lowest value if <10 samples have been tested and the mean of the lowest 20% if >10 samples have been tested.

Generic Notes – Sutcliffe Investigations Geoenvironmental Investigations

4. Contamination Laboratory Analysis & Interpretation (including WAC)

General

An assessment of potential contaminants associated with the former usages of the site is undertaken with reference to CLR 8 “*Potential contaminants for the assessment of land*” and the relevant DETR Industry Profile(s).

Common Inorganic Contaminants

These include:

- Metals, most notably cadmium, copper, chromium, mercury, lead, nickel and zinc
- Semi-metals, most notably arsenic, selenium and (water soluble) boron
- Non-metals, most notably sulphur
- Inorganic anions, most notably cyanides (free & complex), sulphates, sulphides and nitrates

With respect to the terminology used by most analytical laboratories:

Total cyanide = Free cyanide + Complex cyanide

Total cyanide (CN) is determined by acid extraction; whereas free cyanide is the water soluble fraction.

Complex cyanide is “bound” in compounds and is hard to breakdown. Laboratory determination of complex CN involves subjecting the sample to uv digestion for determination of both free and total CN.

Thiocyanate (SCN) is a different species combined with sulphur.

Elemental sulphur (S) and free sulphur are the same. Total sulphur is all forms, including that present in sulphates (SO₄) sulphates etc.

There are 2 forms of chromium (Cr), chromium VI and chromium III. Chromium VI is the more toxic of these. In soils, total chromium is determined by a strong aqua regia acid digestion. Chromium VI is an empirical method based on a water extract test.

Common Organic Contaminants

Petroleum hydrocarbons are a mixture of hydrocarbons produced from the distillation of crude oil. They include aliphatics (alkanes, alkenes and cycloalkanes), aromatics (single or multi benzene ringed compounds) and hydrocarbon-like compounds containing minor amounts of oxygen, sulphur or nitrogen.

Petroleum hydrocarbons can be grouped based on the carbon number range:-

GRO – Gasoline Range Organics (typically C₆ to C₁₀). Also referred to as PRO – Petroleum Range Organics

DRO – Diesel Range Organics (typically C₁₀ to C₂₈)

LRO – Lubricating Oil Range Organics (typically C₂₈ to C₄₀)

MRO – Mineral Oil Range Organics (typically C₁₈ to C₄₄)

However, it should be borne in mind that the terms “GRO” and “DRO” analysis are purely descriptive terms, the exact definition of which varies.

Total Petroleum Hydrocarbons (TPH) is also a poorly defined term; some testing laboratories regard TPH as hydrocarbons ranging from C₅ – C₄₀, whereas others define TPH as C₁₀ – C₃₀.

The composition of a TPH plume migrating through the ground can vary significantly; this is primarily dictated by the nature of the source (eg petrol, diesel, engine oil etc). Furthermore, different hydrocarbons are affected differently by weathering processes and this can result in further variation in the chemical composition of the TPH.

Gasoline contains light aliphatic hydrocarbons rapidly (especially within the C4 to C5 range) that will evaporate. The aromatic hydrocarbons in gasoline are primarily benzene, toluene, ethylbenzene and xylenes, referred to as BTEX. Small amounts of polyaromatic hydrocarbons (PAHs) such as benzo(a)pyrene may also be present.

Diesel and light fuel oils have higher molecular weights than gasoline. Consequently, they are less volatile and less water soluble. About 25 to 35% is composed of aromatic hydrocarbons. BTEX concentrations are generally low.

Heavy Fuel Oils are typically dark in colour and considerably more viscous than water. They contain 15 to 40% aromatic hydrocarbons. Polar NSO compounds are also present.

Lubricating Oils are relatively viscous and insoluble in groundwater. They may contain 10 to 30% aromatics, including the heavier PAHs. NSO compounds are also common.

Polycyclic Aromatic Hydrocarbons (PAHs) have more than two fused benzene rings as a structural characteristic. PAH compounds are present in both petrol and diesel, although insignificantly lower concentrations than in coal tars. Certain PAH compounds are carcinogenic (Benzo(a)pyrene) and/or mobile in the environment (naphthalene).

Polychlorinated Biphenyls (PCBs)

Volatile Organic Compounds (VOCs) The volatile organic compound (VOC) headspace concentration of all soil samples was made with a photoionization detector (PID) fitted with a 10.2 eV lamp. This gives a semi-quantitative VOC concentration record as parts per million (ppm) (Vol/Vol). Prior to the VOC headspace reading, the background levels of VOCs were recorded. The PID was recalibrated with standard isobutylene in zero air after every 10 headspace readings.

Semi-Volatile Organic Compounds (sVOCs)

Phenols

Solvents, pesticides, herbicides

Dioxins & furans

Methods of Analysis (Organic Compounds)

Toluene Extractable Matter (TEM) results provide a screening test for organic contamination. The sample is air dried at 30°C and ground prior to addition of the solvent (toluene). The solvent extraction is aggressive and most organic compounds (fuels, oils, tars, humic material, animal fats and vegetable oil) are dissolved, as are some other inorganic contaminants such as sulphur. However, the volatiles (lighter fuel fraction etc) are lost during evaporation of the solvent.

Total Petroleum Hydrocarbon (TPH) by IR (also known as mineral oil by some testing laboratories) is undertaken on "as received" samples. Tetrachloroethylene is the solvent, and fluorosil is used to removed humic material, animal fats and vegetable oil. Consequently this analysis detects a wide range of "mineral" organics from volatiles (BTEX and gasoline) through diesel and oils to tars (including the very heavy, stable tars such as asphalt and bitumen).

TPH by GC-FID is more refined analytical technique which only detects hydrocarbons (aliphatic and aromatic) in the range C₁₀ to C₄₀ (volatiles, heavy tars, humic material and sulphur are not detected). The laboratory can provide a breakdown of the TPH results into diesel range organics (**DRO**) and heavier lubricating oil range organics (**LRO**).

GRO (PRO) by GC-FID analysis detects the more volatile C₆ – C₉ hydrocarbons (aliphatic and aromatic) including those organic compounds present in petrol.

Speciated VOC (by GC-MS) analysis quantifies the concentrations of 30 USA-EPA priority compounds. These include chlorinated alkanes and alkenes (in the molecular weight range chloroethane to tetrachloroethane); trimethylbenzenes; and the 4 BTEX compounds (benzene, ethyl-benzene, toluene & xylene).

Speciated sVOC by (GC-MS) analysis quantifies the concentration of a variety of organic compounds, including the 16 USA-EPA priority PAHs, phenols, 7 USA EPA priority PCB congeners, herbicides & pesticides.

Note: PAHs are hydrocarbons and consequently (where present) will be picked up when scheduling TPH by GC-FID. Naphthalene (the lightest PAH) is also one of the 58 US EPA VOCs.

Speciated TPH by GC-FID provides a “banded” TPH, initially split into aromatic and aliphatic fractions and then further divided into fraction specific carbon bandings based upon behavioural characteristics.

Note: Risk assessment models require physiochemical properties (solubilities, toxicities etc) of compounds in order to model their behaviour in the environment. These physiochemical properties cannot be derived from a single “TPH”, “GRO” or “DRO” value. However, the carbon banded fractions can be used in risk assessment models.

If the relative proportion of each carbon banding within the “TPH” impact at a site is known, the risks posed by each individual fraction can be assessed and a simple back calculation applied to calculate an overall “TPH” screening value based upon the percentage weight fraction of each banding present in the “TPH”. Specialised analytical techniques and data interpretation skills are required to identify each carbon banding.

Current Guidance

The UK approach to the consideration of contaminated land is based upon the principles of risk assessment. This in turn is founded upon the use of so called source⇒ pathway⇒ target principles in order to establish the presence or potential presence of a pollutant linkage.

Sutcliffe Investigations adopt a tiered approach to risk assessment, consistent with UK guidance and best practice. The initial step of such a risk assessment (or Tier 1) is the comparison of site data with appropriate guidance levels, intervention levels or remedial targets.

In March 2002 DEFRA and the Environment Agency published a series of technical research papers (R & D Publications CLR 7, 8, 9 and 10) introducing the UK approach to the assessment of risk to **human health** from land contamination. This methodology and approach represents current scientific knowledge and thinking. The overall methodology also included the Contaminated Land Exposure Model (CLEA) and some Soil Guidance Values (SGV's).

At the time of writing this report, these guidelines only address seven contaminants and the development of both the CLEA model and additional SGV's is ongoing. Where published, SGV's have been utilised as intervention values for the purpose of an initial Tier 1 assessment.

Where SGV's were not published at the time of writing this report, appropriate Tier 1 human health related assessment have been based upon information that was best available at the time of the study.

With respect to the assessment of potential **phytotoxic effects** of contaminants, Sutcliffe Investigations refer to “The Soil Code” (Maff, 1998) for copper and zinc. The CLEA SGV is adopted for nickel.

The potential risk to **building materials** is considered through reference to relevant BRE Digests, with particular emphasis on BRE Special Digest 1, ‘Sulphate and Acid Resistance of Concrete in the Ground’, 2001.

With respect to the interpretation of the calorific values, at present there are no accepted methods to assess whether a sample is combustible and under what circumstances it might smoulder. Some guidance is given in ICRCL Note 61/84 “Notes on the fire hazards of contaminated land” which states that:

“In general it seems likely that materials whose CV's exceed 10MJ/kg are almost certainly combustible, while those with values below 2MJ/kg are unlikely to burn”.

Tier 1 **groundwater** risk assessments are undertaken by comparing leachate concentrations with the appropriate water quality standard. Depending upon the specific characteristics and environmental setting of the site the appropriate standard is likely to be one of the following:

- Water Supply (Water Quality) Regulations 1989
- Environmental Quality Standards (for Freshwater)
- The Surface Waters (Abstraction for Drinking Water) Regulations

The tier 1 risk assessment of **landfill gas** is undertaken through reference to the following documents:

- Approved Document C, Building Regulations 1991
- CIRIA Report 149, “Protecting Development from Methane”, 1995

Should any Tier 1 criteria be exceeded, then three potential courses of action are available. (The first is only applicable in terms of human health, but the second and third could also be applied to groundwater or landfill gas).

- Undertake further statistical following the approach set out in Appendix A of CLR 7 in order to determine whether contaminant concentrations of inorganic contaminants within soil/fill actually present a risk (only applicable to assessing the risk to human health).
- Based on a qualitative risk assessment, advocate an appropriate level of remediation to “break” the pollutant linkage – for example the removal of the contaminated materials or the provision of a clean cover.
- Carry out a more detailed quantitative risk assessment in order to determine whether contamination risks actually exist.

However, the issue of **averaging area** requires further consideration. CLR 7 is ambiguous and could be interpreted as advocating the concept of a single garden as an appropriate averaging area.

This concept has massive implications with respect to ground investigation design and cost. To comply, investigations for residential development on brownfield sites would need to recover and analyse about 6 samples from each garden; this implies exploratory locations on a very tight grid, perhaps 5m to 10m spacings, with a huge increase in the number of samples analysed (cf test schedules currently issued by most practitioners).

In any case, Sutcliffe Investigations consider the concept of a single garden as an averaging area to be inappropriate. Statistical analysis of sample results by fill type, and/or by former use in a given sub-area of the site (i.e. with reference to the Conceptual Site Model), is considered a more appropriate methodology.

Analysis by soil/fill type is appropriate for essentially immobile contaminants associated with a particular fill type, for example arsenic in colliery spoil, metals in ash & clinker, sulphate in plaster-rich demolition rubble etc.

Analysis by former use is appropriate where more mobile contaminants have entered the ground, for example diesel associated with leakage from a former fuel tank, downward migration of leachable metals through granular materials, various soluble contaminants present in a wastewater leaking into the ground via a fractured sewer etc. In these circumstances, it may be appropriate to undertake statistical analysis of sample results from a variety of different soil/fill types. However, consideration would have to be given to factors such as porosity which might influence impregnation of a mobile contaminant into the soil mass; ie contamination would be normally be more pervasive and significant in granular soils than cohesive soils.

There is a suggestion in para 4.7 of CLR 7 that the approach outlined above was intended and the Environment Agency have confirmed that an averaging area can be larger than a single garden, if:

- Contaminant concentrations are within the same statistical population as determined using the maximum value test. The sample data being representative of the averaging area and the mean concentration of the averaging area.
- “Hot spots” are treated as separate zones or averaging areas (as defined by the maximum value test).
- The sampling strategy takes into account uncertainty (spatial heterogeneity) in contaminant concentration

Waste Classification & WAC

In the context of waste soils generated by remediation and/or groundworks activities on brownfield sites, the following definitions (from the Landfill Regulations 2002) apply:

- Inert (e.g. uncontaminated ‘natural soil, bricks, concrete, tiles & ceramics)
- Non-Hazardous (e.g. soil excavated from a contaminated site which contains dangerous substances, but at concentrations below prescribed thresholds).
- Hazardous (e.g. soil excavated from a contaminated site which contains dangerous substances at concentrations above prescribed thresholds).

Dangerous substances include compounds containing a variety of determinants commonly found in contaminated soils on brownfield sites, for example arsenic, lead, chromium, benzene etc.

From 16th July 2005, landfill operators will require Waste Acceptance Criteria (WAC) laboratory data, if soil is classified as **hazardous** and such waste must have been subjected to pre-treatment. However, subject to WAC testing it may be possible to classify it as stable, non-reactive hazardous waste, which can be placed within a dedicated cell within the non-hazardous landfill.

Sutcliffe Investigations typically only include WAC analysis in site investigation proposals and reports, if significant off-site disposal (of soil classified as hazardous waste) is anticipated for example where redevelopment proposals include basement construction etc.

If off-site disposal of soils classified as hazardous waste were undertaken during redevelopment, then WAC analysis should be scheduled at an early stage in the remediation programme.

However, organic compounds (BTEX, TPH, PAH etc) are the most common contaminants that result in soils being classed as hazardous. These contaminants can often be dealt with by alternative technologies (eg by bioremediation or stabilisation) and consequently retention on site is often possible.

It should be noted that **non-hazardous** soil waste can go to a non-hazardous landfill facility; no further testing (eg WAC) is required.

Generic Notes – Sutcliffe Investigations

5. Hazardous Gas

General

Hazardous gas is considered to be any mixture of potentially explosive, toxic or asphyxiating gases, most notably methane, carbon dioxide and oxygen (deficiency).

In addition, radon, a naturally occurring radioactive gas is also considered. Further information about radon is included in Notes 1 – Environmental Setting.

Assessment of potential risks associated with hazardous gas are based on a review of data obtained from the Landmark information Group, the Environment Agency and the Local Authority and the British Geological Survey.

Reference is also made to historical OS plans, which are inspected for evidence of backfilled quarries, railway cuttings, colliery spoil tips etc.

Where landfilling has occurred within 250m of the site boundary, the Local Planning Authority may request a landfill gas investigation in accordance with the Town and Country Planning General Development Order, 1988.

Sources

Potential sources of hazardous gas are:

- Landfill sites
- Made ground, especially where significant depths are present
- Shallow mineworks associated with coal extraction
- Geological strata, including peat, organic silts, coal-bearing strata and limestone (reaction with acidic waters), granite (radon)
- Groundwater can sometimes act as a “carrier” for hazardous gas
- Leakages from pipelines or storage tanks
- Sewers, septic tanks and cess pits

Generation

Wherever biodegradable material is deposited, landfill gas (principally a mixture of methane and carbon dioxide) is likely to be generated by microbial activity. Carbon dioxide is an asphyxiant and toxic; methane is flammable and a mixture containing between 5% and 15% methane by volume in air is explosive. Landfill gas in the ground is unlikely in itself to pose a significant risk, though it may damage vegetation. However, infiltration of landfill gas into confined spaces (e.g. cellars, services, etc) may give rise to considerable risk.

There is no typical figure for the length of time that landfill gas will be evolved, but at many sites significant gas generation continues for at least 15 years after the last deposit of waste.

Migration

Gas migration from a landfill site may occur in several ways. It may migrate through adjacent strata; the distance of migration being dependent on the pressure gradients, volume of gas and permeability of the strata. Where there are faults, cavities and fissures within the strata, gas may move considerable distances. Other migration pathways for gas include man-made features such as mine shafts, roadways and underground services.

Gas migration is influenced by a number of climatic factors, such as atmospheric pressure variations, water table level variations and the influence of a covering of snow or ice over the surface of the site and surrounding area.

Current Guidance

Guidance on landfill gas monitoring control at landfill sites is given two technical memoranda, Waste Management Paper Nos. 26 and 27 published by the Department of the Environment.

Waste Management Paper 27, 1991 recommends that no dwellings should be constructed within 50m of any landfill that has the capacity to produce large volumes of landfill gas. No garden should extend to within 10m of the landfilled waste. However, development closer to landfill has been permitted where a comprehensive gas risk assessment has been completed (typically based on a minimum of 6 to 12 month monitoring programme) and appropriate gas exclusion measures designed.

The current advice with regard to monitoring for landfill gas is that if the trigger value of 1% volume (20% LEL) for methane and 1.5% volume for carbon dioxide is exceeded then remedial/control measures will be required.

It should be noted that the guideline limit for carbon dioxide of 1.5% volume recommended in Waste Management paper No. 27 is the short term (10 minute) occupational exposure limit for carbon dioxide quoted by the Health and Safety Executive in their publication EH40. The long term (8 hour) occupational exposure limit for carbon dioxide is 0.5% volume.

Approved Document C to the Department of the Environment's Building Regulations 1992 requires what where there may be gaseous contamination of the ground but the level of methane is unlikely to exceed 1% by volume, the ground floor of any house or similar small building shall be constructed of suspended concrete and ventilated as described in BRE Digest Report "Construction of New Buildings on Gas Contaminated Land". The document also requires specific design measures to be taken if a level of 5% volume carbon dioxide exists or is exceeded within the ground.

Although the above guidance is still relevant it has been more recently updated within the following documents published by the Construction Industry Research and Information Association (CIRIA).

CIRIA Report 149	'Protecting Development from Methane' (1995)
CIRIA Report 150	'Methane Investigation Strategies' (1995)
CIRIA Report 151	'Interpreting Measurement of Gas in the Ground' (1995)
CIRIA Report 152	'Risk Assessment for Methane and other gases from the ground' (1995)

The above documents are intended to provide advice on how to investigate and deal with the gas contaminated ground with respect to development.

CIRIA Report 149 characterised sites based on the recorded methane/carbon dioxide concentration and emission rates recorded during a suitable gas investigation. Characteristic situation 1 is deemed to be the lowest risk scenario with the risk rating increasing up to 6. The characteristic situations are classified as follows:

Gassing regime in ground			
Methane (% by volume in air)	Carbon dioxide (% by volume in air)	Emission rate ¹ (m/s)	Characteristic situation ²
< 0.1	< 1.5	not detected	1
> 0.1 – 1	> 1.5 – 5	not detected	2
> 1 - 5	< 5	not detected	3
> 5 – 20	< 20	< 0.01	4
> 20	> 20	> 0.01 – 0.05	5
> 20	> 20	> 0.05	6

Notes:

1. Emission rate values measures as equivalent total gas flow velocity from a 50mm diameter borehole: for methods of measurement see Crowhurst and Manchester (1992).
2. Highest measures parameter used as determining factor.

CIRIA Report 151 (1995) identified that there is currently inadequate guidance on trigger concentrations for ground gases. The current emphasis on using gas concentrations for trigger values particularly in Waste Management Paper 27 and the Building Regulations, should be revised to consider gas pressures, borehole flow rates and estimated surface emission rates.

It was concluded that the most important aspect of relating the gas regime below or adjacent to a site, to the risk it poses to any development, is the surface emission rate i.e. how quickly the gas is coming out of the ground. The lower the surface emission rate the lower the risk. This is considered further in the DETR Partners in Technology Report 'Passive venting of soil gases beneath buildings' (September 1997).

CIRIA Report 149 (1995), reference Table 28, reviewed over 100 case studies of development affected by gas to establish current UK practices for gas control. The report classified the gassing regimes found within 6 Characteristic Situations. The highest measures parameter, either methane or carbon dioxide concentration and/or emission rate were used to define the Characteristic Situation for each case history site. The report then related the typical range of mitigation measures that has been adopted at each study site to the characteristic gas situation.

To achieve a more consistent design of protection measures Table 28 of CIRIA 149 was rewritten (Wilson and Card, 1999) in terms of borehole gas volume flow rate and gas concentrations, as reproduced in the table below. This was done to reflect the importance of recognising the gas surface emission rate.

Characteristic situations based on Gas Flux

Characteristic Situation	Limiting CH ₄ Concentration (% v/v)	Limiting CO ₂ Concentrations (% v/v)	Limiting Borehole Flow Velocity (m/s)	Limiting Borehole Gas Volume Flow (litre/hour)	
				CH ₄	CO ₂
1	< 0.1	< 0.1	< 0.005	< 0.035	< 0.035
2	< 1.0	< 1.5	< 0.005	< 0.35	< 0.5
3	< 5.0	< 5.0	< 0.005	< 1.75	< 1.75
4	< 20	< 20	< 0.01	< 14	< 14
5	> 20	> 20	< 0.05	< 70	< 70
6	> 20	> 20	< 0.05	> 70	> 70

Gas Monitoring Procedure

Sutcliffe Investigations adopt a standard gas monitoring procedure, in accordance with CIRIA guidance. This procedure involves the measurement, in the following order of:

- Atmospheric temperature, pressure and ambient oxygen concentration on site immediately prior to and on completion of monitoring.
- Gas emission rate.
- Methane, oxygen and carbon dioxide concentrations using an infra-red gas analyser.
- Standing water level using a dipmeter.

In addition, ground conditions at each sampling location are recorded together with prevailing weather conditions and any other observations such as any vandalism.

Where samples of gas are required for laboratory analysis, Gresham Tubes are used. Gas concentrations in the well are typically recorded immediately before and after retrieval of a sample.

Appendix B – CIRIA Guidance Document C552 2001

RISK ASSESSMENT METHODOLOGY

GENERAL

The purpose of this appendix is to describe in detail the concepts underlying the risk based approach to assessing potentially contaminated land, introduce the roles of key legislation and describe the qualitative methodology adopted for evaluating and characterising risk.

Current best practice in the UK promotes a risk-based approach to dealing with both soil and groundwater contamination. The principal aim of the approach is to ensure protection of human health and the environment in a thorough, transparent and cost-effective manner.

Fundamental to the risk-based approach is the concept that for 'Contaminated Land' to be designated, as a consequence of historic activities, a pathway for contamination must be shown to exist between a source of contamination and a receptor. The combined presence of a source, pathway and a receptor is described as a 'pollutant linkage'.

The concepts associated with a contaminant source, pathway and receptor are defined in DETR Circular 02/2000 'Contaminated Land Environmental Protection Act 1990: Part II A'. A **source** of contamination may be considered as a 'substance, which is in, on or under land that has the potential to cause harm or to cause pollution of controlled waters'. A **receptor** can be considered as either 'a living organism, a group of living organisms, an ecological system or a piece of property which is being, or could be harmed, by a contaminant or controlled waters which are being, or could be, polluted by a contaminant'. A **pathway** may be considered as one or more routes by, or through, which a receptor is being, or could be, exposed to or affected, by a contaminant. Typical pathways may include migration in groundwater, surface water run-off or infiltration, inhalation, dermal contact and ingestion.

The risks posed by an identified pollutant linkage can often be mitigated by removing the source of contamination, treating the source of contamination, blocking the relevant pathway(s) or by protecting the receptor.

PRINCIPLES OF RISK EVALUATION

The risk evaluation methodology presented below is qualitative in nature, and is therefore a subjective method. It is based upon guidance presented in CIRIA publication referenced C552, 'Contaminated land risk assessment - A guide to good practice', 2001 and involves the classification of the following.

The magnitude of the potential **consequence** (severity) of risks occurring (Table 1).

The magnitude of the **probability** (likelihood) of the risk occurring (Table 2).

These are then considered in conjunction to give a risk matrix (Table 3)

Table 1 - Classification of consequence

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in “significant harm” as defined by the Environmental Protection Act 1990, Part IIA. Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health (“significant harm” as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem. (Note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).	Concentrations of a contaminant from site exceed the generic or site-specific assessment criteria. Leaching of contaminants from a site to a major or minor aquifer. Death of a species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services (“significant harm” as defined in the <i>Draft Circular on Contaminated Land</i> , DETR, 2000). Damage to sensitive buildings/structures/ services or the environment.	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discolouration of concrete.

Table 2 - Classification of probability

Classification	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Table 3 - Comparison of consequence against probability

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table 4 - Description of the classified risks and likely action required

Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate Risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Table 5 - Response action likely to be required in relation to estimated risk

KEY

	Mitigation and remedial measures required
	Mitigation and remedial measures likely
	Remedial measures unlikely
	Remedial measures not required

Appendix C – Cable Percussion, Trial Pit and Dynamic Sampling Borehole Logs

 Sutcliffe							Site Chorlton Irish Club		Borehole Number BH101	
Boring Method Cable Percussion		Casing Diameter			Ground Level (mOD)		Client Southway Devco Ltd		Job Number 31296LG	
		Location			Dates 17/05/2021		Engineer Michael Wiggins, Jack Smith		Sheet 1/1	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
1.20-1.65	SPT N=12			Water strike(1) at 0.70m. Water strike(2) at 1.00m. 2,3/3,3,3,3		0.10 (0.30)	(MADE GROUND) Tarmac.		Σ1 Σ2	
						0.40 (0.20) 0.60	(MADE GROUND) Dark brown, gravelly, ashy, fine-coarse SAND. Gravel is fine-coarse, angular, of brick. Occasional cobbles of brick.			
2.00-2.45	SPT N=15			2,3/3,4,4,4		(1.40) 2.00	Light brown, slightly gravelly, fine-coarse SAND. Gravel is fine-medium, subrounded, of sandstone and natural stone.			
3.00-3.45	SPT N=11			1,2/2,3,3,3		2.00 (1.70)	Light greyish brown, slightly gravelly, fine-medium SAND. Gravel is fine-medium, subrounded, of natural stone.			
4.00-4.45	U1			21 blows		3.70	Brown, very gravelly, fine-coarse SAND. Gravel is fine-medium, subangular-subrounded, of natural stone.			
5.00-5.45 5.00-5.45	SPT N=14 B1			1,2/3,3,4,4			Firm, brown, gravelly CLAY. Gravel is fine-coarse, subangular-subrounded, of natural stone.			
6.00-6.45	SPT N=15			2,3/3,4,4,4		(5.30)				
7.50-7.95	U2			22 blows						
9.00-9.45	SPT N=10			1,2/2,2,3,3		9.00	Soft-firm, brown, slightly silty CLAY.			
10.00-10.50	B2					(2.00)				
10.50-10.95	SPT N=12			1,2/2,3,3,4		11.00	Stiff, brown, very sandy, gravelly CLAY. Sand is fine-medium, gravel is fine-medium, subrounded, of natural stone.			
12.00-12.30 12.00-12.45	SPT 50/150 B3			7,12/21,29		11.80 (2.15)	Very stiff, brown, sandy, gravelly CLAY. Sand is fine-medium, gravel is fine-medium, subrounded-rounded, of natural stone.	 		
13.50-13.75	SPT 50/100			12,22/33,17		13.95	Complete at 13.95m			
Remarks Drilling contractor: VC Drilling.								Scale (approx) 1:75	Logged By JS	Figure No. 31296LG.BH101



Sutcliffe

Site

Chorlton Irish Club

**Trial Pit
Number**
TP101

Excavation Method

Trial Pit

Dimensions

Ground Level (mOD)

Client

Southway Devco Ltd

**Job
Number**
31296LG

Location

Dates

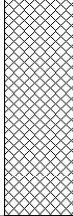
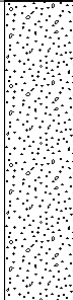
17/05/2021

Engineer

Michael Wiggins, Jack Smith

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.40	ES1				(0.10)	(MADE GROUND) Tarmac.		
					0.10	(MADE GROUND) Dark brown, fine-coarse, angular-subangular GRAVEL, of tarmac. Slight hydrocarbon odour.		
					(0.10)			
					0.20			
					(0.60)	(MADE GROUND) Dark brown, gravelly, fine-coarse SAND. Gravel is fine-coarse, angular, of brick, tarmac and occasional pottery. Occasional cobbles of brick.		
0.80	Light brown, slightly gravelly, fine-coarse SAND. Gravel is fine-coarse, subrounded, of sandstone.							
					(0.80)			
					1.60	Complete at 1.60m		

Remarks

Excavation/Plant contractor: Clive Hurt Plant Hire



Scale (approx)

1:20

Logged By

MW

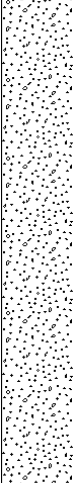
Figure No.

31296LG.TP101

 Sutcliffe					Site Chorlton Irish Club		Trial Pit Number TP102		
Excavation Method Trial Pit		Dimensions		Ground Level (mOD)		Client Southway Devco Ltd		Job Number 31296LG	
		Location		Dates 17/05/2021		Engineer Michael Wiggins, Jack Smith		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.20-0.50	ES1				(0.10)	(MADE GROUND) Tarmac.			
					0.10	(MADE GROUND) Dark brown, gravelly, fine-coarse SAND. Gravel is fine-coarse, angular, of tarmac and brick.			
					(0.10)				
					0.20	(MADE GROUND) Dark brown, slightly silty, gravelly, fine-coarse SAND. Gravel is fine-coarse, angular, of brick. Occasional cobbles of brick.			
					(0.60)				
					0.80	Light brown, slightly gravelly, fine-coarse SAND. Gravel is fine-coarse, subangular-subrounded, of natural stone.			
					(0.90)				
					1.70	Complete at 1.70m			
					Remarks Excavation/Plant contractor: Clive Hurt Plant Hire.				
					Scale (approx) 1:20		Logged By MW		Figure No. 31296LG.TP102

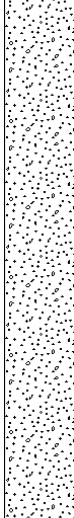


Sutcliffe

						Site Chorlton Irish Club		Number WS101	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client Southway Devco Ltd		Job Number 31296LG	
		Location		Dates 17/05/2021		Engineer Michael Wiggins, Jack Smith		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.30-0.50	ES1				(0.10) (0.20) 0.30 (0.20) 0.50	(MADE GROUND) Tarmac. (MADE GROUND) Dark brown blackish, sandy, angular-subangular, fine-coarse GRAVEL, of tarmac. Sand is fine-coarse. Slight hydrocarbon odour. (MADE GROUND) Dark brown, slightly silty, gravelly, fine-coarse SAND. Gravel is fine-coarse, angular, of brick. Occasional cobbles of brick.	  		
1.20-1.65	SPT N=9		1,2/2,2,2,3			Greyish light brown, slightly gravelly, fine-coarse SAND. Gravel is fine-medium, subrounded, of sandstone. (Below 2.00m is reddish brown. Below 3.00m is brown).			
2.00-2.45	SPT N=12		2,3/3,3,3,3		(3.00)				
3.00-3.45	SPT N=15		3,3/4,4,3,4						
					3.50	Stiff, brown, slightly silty, slightly sandy CLAY. Sand is fine-medium.			
4.00-4.45	SPT N=19		4,3/3,5,5,6		(0.50) 4.00	NO RECOVERY.			
					(1.45)				
5.00-5.45	SPT N=12		3,3/3,3,3,3						
					5.45	Complete at 5.45m			
Remarks Drilling contractor: VC Drilling								Scale (approx)	Logged By
								1:40	MW
								Figure No. 31296LG.WS101	

 Sutcliffe						Site Chorlton Irish Club		Number WS102	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client Southway Devco Ltd		Job Number 31296LG	
		Location		Dates 17/05/2021		Engineer Michael Wiggins, Jack Smith		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.10-0.30	ES1				(0.10) (0.10) (0.20) (0.30) (0.20) 0.50	(MADE GROUND) Tarmac.			
0.50-1.00	B1					(MADE GROUND) Black, sandy, angular-subangular, fine-coarse GRAVEL, of tarmac. Sand is fine-coarse.			
						(MADE GROUND) Dark brown, very gravelly, ashy, fine-coarse SAND. Gravel is fine-coarse, angular-subangular, of brick. Occasional fine-coarse clinker.			
1.20-1.65	SPT N=8		2,2/2,2,2,2		(2.00)	Light brown, slightly gravelly, fine-medium SAND. Gravel is fine-medium, rounded-subrounded, of natural stone.			
2.00-2.45	SPT N=11		2,3/3,2,3,3						
3.00-3.45	SPT N=14		Water strike(1) at 3.00m. 3,3/4,3,3,4		2.50 (0.80) 3.30 (0.20) 3.50 (0.50) 4.00 (0.40) 4.40 (0.60) 5.00	Orangey brown, clayey, gravelly, slightly cobbly, fine-coarse SAND. Gravel is fine-coarse, subangular-subrounded, of natural stone. Cobbles are subrounded-rounded, of natural stone.		V1	
						Firm-stiff, brown, slightly sandy, slightly gravelly CLAY. Gravel is fine-medium, subrounded-rounded, of natural stone.			
						Stiff-very stiff, brown, slightly sandy, slightly gravelly CLAY. Gravel is fine-medium, subrounded-rounded, of natural stone. Sand is fine-medium.			
						Light brown, gravelly, fine-coarse, wet SAND. Gravel is fine-medium, rounded, of mixed lithology.			
						Firm-stiff, light brown, very sandy, slightly gravelly CLAY. Sand is fine-medium, gravel is fine-medium, subrounded-rounded, of natural stone.			
						Complete at 5.00m			
Remarks Drilling contractor: VC Drilling. Took barrel to 4.00m, hole collapsed to 3.00m, barrel sent back down to 5.00m.							Scale (approx) 1:40	Logged By JS	
							Figure No. 31296LG.WS102		

 Sutcliffe						Site Chorlton Irish Club		Number WS103	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client Southway Devco Ltd		Job Number 31296LG	
		Location		Dates 17/05/2021		Engineer Michael Wiggins, Jack Smith		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
0.25-0.70	ES1								

						Site Chorlton Irish Club		Number WS104	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client Southway Devco Ltd		Job Number 31296LG	
		Location		Dates 17/05/2021		Engineer Michael Wiggins, Jack Smith		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
0.30-0.70 0.30-0.70	B1 ES1				(0.10) (0.10) (0.20) 0.30 (0.40) 0.70	(MADE GROUND) Tarmac. (MADE GROUND) Dark brown, gravelly, fine-coarse SAND. Gravel is fine-coarse, angular, of brick, tarmac and natural stone. (MADE GROUND) Dark brown, slightly silty, slightly gravelly, fine-medium SAND. Gravel is fine-coarse, angular-subangular, of brick and natural stone. Light brown, slightly gravelly, fine-coarse SAND. Gravel is fine-medium, subrounded-rounded, of sandstone. (Below 2.20m is very gravelly).		  	
1.20-1.65	SPT N=8		1,2/2,2,2,2						
2.00-2.45	SPT N=11		2,3/3,3,2,3		(3.00)				
3.00-3.45	SPT N=13		3,3/3,3,3,4						
					3.70	Soft, brown, sandy CLAY. Sand is fine-medium.			
4.00-4.45	SPT N=11		2,2/3,2,3,3		(0.45) 4.15 (0.15) 4.30	Brown, silty, very gravelly, fine-coarse SAND. Gravel is fine-medium, rounded, of natural stone.			
					(0.70)	Firm-stiff, brown, slightly sandy CLAY. Sand is fine-medium.			
5.00-5.45	SPT N=14		3,2/3,4,3,4		5.00	Complete at 5.45m			
Remarks Drilling contractor: VC Drilling.								Scale (approx) 1:40	Logged By MW
								Figure No. 31296LG.WS104	

Appendix D – Analytical Certificates

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/05379
Issue Number: 1

Date: 26 May, 2021

Client: Sutcliffe
18-20 Harrington Street
Liverpool
L2 9QA

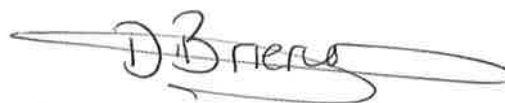
Project Manager: (Use) D Evans; D Bowen; A Tosh; W Baldwin; J Smith
Project Name: Chorlton Irish Club
Project Ref: 31296
Order No: 8583
Date Samples Received: 18/05/21
Date Instructions Received: 18/05/21
Date Analysis Completed: 26/05/21

Prepared by:



Melanie Marshall
Laboratory Coordinator

Approved by:



Danielle Brierley
Client Manager

Envirolab Job Number: 21/05379

Client Project Name: Chorlton Irish Club

Client Project Ref: 31296

Lab Sample ID	21/05379/1	21/05379/2	21/05379/3	21/05379/4	21/05379/5	21/05379/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS104	TP101	TP102				
Depth to Top	0.30	0.10	0.25	0.30	0.20	0.20				
Depth To Bottom	0.50	0.30	0.70	0.70	0.40	0.50				
Date Sampled	17-May-21	17-May-21	17-May-21	17-May-21	17-May-21	17-May-21				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil				
Sample Matrix Code	6AB	4AB	6AB	6A	4AB	6AB				
% Moisture at <40C _A	16.5	8.8	16.2	14.8	13.5	18.6		% w/w	0.1	A-T-044
% Stones >10mm _A	3.5	28.4	15.1	31.1	15.5	5.4		% w/w	0.1	A-T-044
pH _D ^{M#}	6.86	8.03	8.12	7.88	7.83	7.22		pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.02	0.03	0.02	0.02	0.02	<0.01		g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	360	290	590	780	470	310		mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<1	<1	2	<1	<1	<1		mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		mg/kg	0.2	A-T-050s
Sulphide _A	10	8	<5	<5	<5	<5		mg/kg	5	A-T-S2-s
Sulphur (elemental) _D ^{M#}	58	<5	<5	180	<5	<5		mg/kg	5	A-T-029s
Organic matter _D ^{M#}	4.8	8.7	10.9	5.2	17.4	4.8		% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	15	15	12	12	23	11		mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		mg/kg	1	A-T-027s
Cadmium _D ^{M#}	<0.5	0.7	<0.5	0.8	0.6	<0.5		mg/kg	0.5	A-T-024s
Copper _D ^{M#}	40	46	39	119	57	47		mg/kg	1	A-T-024s
Chromium _D ^{M#}	20	24	23	15	20	14		mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1		mg/kg	1	A-T-040s
Chromium (trivalent)	20	24	23	15	20	14		mg/kg	1	Calc
Lead _D ^{M#}	107	42	666	209	150	76		mg/kg	1	A-T-024s
Mercury _D	4.80	0.31	1.89	2.42	2.81	2.67		mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	16	49	20	23	39	15		mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1	<1	<1	<1		mg/kg	1	A-T-024s
Zinc _D ^{M#}	56	69	84	201	85	51		mg/kg	5	A-T-024s

Envirolab Job Number: 21/05379

Client Project Name: Chorlton Irish Club

Client Project Ref: 31296

Lab Sample ID	21/05379/1	21/05379/2	21/05379/3	21/05379/4	21/05379/5	21/05379/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS104	TP101	TP102				
Depth to Top	0.30	0.10	0.25	0.30	0.20	0.20				
Depth To Bottom	0.50	0.30	0.70	0.70	0.40	0.50				
Date Sampled	17-May-21	17-May-21	17-May-21	17-May-21	17-May-21	17-May-21				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil				
Sample Matrix Code	6AB	4AB	6AB	6A	4AB	6AB				
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	NAD	NAD	NAD				A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	N/A	N/A				A-T-045

Envirolab Job Number: 21/05379

Client Project Name: Chorlton Irish Club

Client Project Ref: 31296

Lab Sample ID	21/05379/1	21/05379/2	21/05379/3	21/05379/4	21/05379/5	21/05379/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS104	TP101	TP102				
Depth to Top	0.30	0.10	0.25	0.30	0.20	0.20				
Depth To Bottom	0.50	0.30	0.70	0.70	0.40	0.50				
Date Sampled	17-May-21	17-May-21	17-May-21	17-May-21	17-May-21	17-May-21				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil				
Sample Matrix Code	6AB	4AB	6AB	6A	4AB	6AB				
PAH-16MS										
Acenaphthene _A ^{M#}	3.36	0.35	67.4	0.49	2.09	2.22		mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.17	0.23	0.44	0.34	0.17	0.07		mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	9.51	0.27	34	2.26	7.00	1.62		mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	8.82	0.76	30.7	13.6	7.04	4.78		mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	6.96	0.53	19.4	9.86	3.84	4.79		mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	6.91	0.54	22.2	9.65	3.92	4.90		mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	3.32	0.21	8.37	4.41	1.46	2.06		mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	4.06	0.16	9.84	3.91	1.55	1.70		mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	10.1	0.73	36.9	10	4.70	3.92		mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.52	0.05	1.60	1.20	0.36	0.48		mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	25.8	1.57	97.3	17.7	17.1	11.8		mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	3.32	0.07	47.9	0.41	2.17	1.37		mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	4.41	0.32	11	6.66	2.19	2.96		mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.30	<0.03	63.6	0.15	0.12	0.77		mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	21	0.45	182	3.53	15.3	6.22		mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	20.8	1.63	75.2	18.4	13.3	11		mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	129	7.87	708	103	82.3	60.7		mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/05379

Client Project Name: Chorlton Irish Club

Client Project Ref: 31296

Lab Sample ID	21/05379/1	21/05379/2	21/05379/3	21/05379/4	21/05379/5	21/05379/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS103	WS104	TP101	TP102				
Depth to Top	0.30	0.10	0.25	0.30	0.20	0.20				
Depth To Bottom	0.50	0.30	0.70	0.70	0.40	0.50				
Date Sampled	17-May-21	17-May-21	17-May-21	17-May-21	17-May-21	17-May-21				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil				
Sample Matrix Code	6AB	4AB	6AB	6A	4AB	6AB				
TPH UKCWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<10	<1	<1	<1	<1		mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<10	<1	<1	<1	<1		mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	3	<10	4	2	2	5		mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	8	<10	6	6	2	7		mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	267	152	51	192	38	14		mg/kg	1	A-T-055s
Ali >C35-C44 _A	61	82	13	60	21	9		mg/kg	1	A-T-055s
Total Aliphatics _A	340	234	74	260	64	35		mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	<10	<1	<1	<1	<1		mg/kg	1	A-T-055s
Aro >C10-C12 _A	1	<10	14	2	2	3		mg/kg	1	A-T-055s
Aro >C12-C16 _A	49	12	47	8	11	33		mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	366	105	99	111	45	143		mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	669	728	173	623	99	414		mg/kg	1	A-T-055s
Aro >C35-C44 _A	29	60	7	31	16	10		mg/kg	1	A-T-055s
Total Aromatics _A	1110	903	340	775	173	603		mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44) _A	1460	1140	414	1040	237	638		mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	0.02	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Sutcliffe, 18-20 Harrington Street, Liverpool, L2 9QA

Project No: 21/05379

Project: Chorlton Irish Club

Date Received: 18/05/2021 (am)

Clients Project No: 31296

Cool Box Temperatures (°C): 9.8

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Appendix E – Soil Screening Tables

Job Number:	31296
Job Name:	Chorlton Irish Club, Cross Road, Chorlton
Proposed Land Use:	Residential Without Plant Uptake
S.O.M.	6.0

	Below Limit of Detection
	Above Threshold
n/t	Not Tested
NAD	No Asbestos Detected

Sample ID	WS101	WS102	WS103	WS104	TP101	TP102
Depth Top	0.30	0.10	0.25	0.30	0.20	0.20
Depth Bottom	0.50	0.30	0.70	0.70	0.40	0.50
Date Sampled	17-May-21	17-May-21	17-May-21	17-May-21	17-May-21	17-May-21
Threshold						
Contaminant	Units	Source	Value			
Arsenic (Total)	mg/kg	LQM S4UL	40	15	15	12
Boron (Soluble)	mg/kg	LQM S4UL	11000	<1.0	<1.0	<1.0
Cadmium (Total)	mg/kg	LQM S4UL	85	<0.5	0.7	<0.5
Chromium III	mg/kg	LQM S4UL	910	20	24	23
Chromium VI	mg/kg	LQM S4UL	6	<1	<1	<1
Copper (Total)	mg/kg	LQM S4UL	7100	40	46	39
Lead (Total)	mg/kg	C4SL	310	107	42	666
Mercury (Total)	mg/kg	LQM S4UL	56	4.8	0.31	1.89
Nickel (Total)	mg/kg	LQM S4UL	180	16	49	20
Selenium (Total)	mg/kg	LQM S4UL	430	<1	<1	<1
Zinc (Total)	mg/kg	LQM S4UL	40000	56	69	84
Cyanide (Total)	mg/kg	ATKINS	34	<1	<1	2
Phenols (Total)	mg/kg	LQM S4UL	2300	<0.2	<0.2	<0.2
Organic matter	%	LQM S4UL	N/a	4.8	8.7	10.9
Sulphate (Acid Soluble)	mg/kg	LQM S4UL	N/a	360	290	590
Sulphate as Water Soluble	g/l	LQM S4UL	N/a	0.02	0.03	0.02
Sulphide	mg/kg	LQM S4UL	N/a	10	8	<5
pH	pH units	LQM S4UL	N/a	6.86	8.03	8.12
Sulphur (Elemental)	mg/kg	LQM S4UL	N/a	58	<5	<5
Asbestos						
Asbestos in soil	N/a		N/a	NAD	NAD	NAD
Asbestos Matrix (microscope)	N/a		N/a	N/A	N/A	N/A
ACM - Suitable for Water Absorption Test?	N/a		N/a	n/t	n/t	n/t
Asbestos in soil % composition	% w/w		0.001	n/t	n/t	n/t
TPH Suite						
TPH (Total)	mg/kg		N/a	1460	1140	414
Total Aliphatic	mg/kg		N/a	340	234	74
>C5 to C6 aliphatic	mg/kg	LQM S4UL	160	<0.01	<0.01	<0.01
>C6 to C8 aliphatic	mg/kg	LQM S4UL	530	<0.01	<0.01	<0.01
>C8 to C10 aliphatic	mg/kg	LQM S4UL	150	<1	<10	<1
>C10 to C12 aliphatic	mg/kg	LQM S4UL	770	<1	<10	<1
>C12 to C16 aliphatic	mg/kg	LQM S4UL	4400	3	<10	4
>C16 to C35 aliphatic	mg/kg	LQM S4UL	110000	275	n/t	57
>C35 to C44 aliphatic	mg/kg	LQM S4UL	110000	61	82	13
Total Aromatic	mg/kg		N/a	1110	903	340
>C5 to C7 aromatic(Benzene)	mg/kg	LQM S4UL	1400	<0.01	<0.01	<0.01
>C7 to C8 aromatic(Toluene)	mg/kg	LQM S4UL	3900	<0.01	<0.01	<0.01
>C8 to C10 aromatic	mg/kg	LQM S4UL	270	<1	<10	<1
>C10 to C12 aromatic	mg/kg	LQM S4UL	1200	1	12	47
>C12 to C16 aromatic	mg/kg	LQM S4UL	2500	49	105	99
>C16 to C21 aromatic	mg/kg	LQM S4UL	1900	366	728	173
>C21 to C35 aromatic	mg/kg	LQM S4UL	1900	669	60	7
>C35 to C44 aromatic	mg/kg	LQM S4UL	1900	29	n/t	n/t
Aliphatic + Aromatic EC >44-70	mg/kg	LQM S4UL	N/a	n/t	n/t	n/t
BTEX Suite						
benzene	mg/kg	LQM S4UL	1.4	<0.01	<0.01	<0.01
toluene	mg/kg	LQM S4UL	3900	<0.01	<0.01	<0.01
ethylbenzene	mg/kg	LQM S4UL	450	<0.01	<0.01	<0.01
M&P Xylene	mg/kg	LQM S4UL	430	<0.01	<0.01	0.02
O-Xylene	mg/kg	LQM S4UL	480	<0.01	<0.01	0.01
PAH Suite						
naphthalene	mg/kg	LQM S4UL	13	<0.30	<0.03	63.6
acenaphthylene	mg/kg	LQM S4UL	6000	0.17	0.23	0.44
acenaphthene	mg/kg	LQM S4UL	6000	3.36	0.35	67.4
fluorene	mg/kg	LQM S4UL	4500	3.32	0.07	47.9
phenanthrene	mg/kg	LQM S4UL	1500	21	0.45	182
anthracene	mg/kg	LQM S4UL	37000	9.51	0.27	34
fluoranthene	mg/kg	LQM S4UL	1600	25.8	1.57	97.3
pyrene	mg/kg	LQM S4UL	3800	20.8	1.63	75.2
benzo(a)anthracene	mg/kg	LQM S4UL	15	8.82	0.76	30.7
chrysene	mg/kg	LQM S4UL	32	10.1	0.73	36.9
benzo(b)fluoranthene	mg/kg	LQM S4UL	4	6.91	0.54	22.2
benzo(k)fluoranthene	mg/kg	LQM S4UL	110	4.06	0.16	9.84
benzo(a)pyrene	mg/kg	LQM S4UL	3.2	6.96	0.53	19.4
dibenzo(ah)anthracene	mg/kg	LQM S4UL	0.32	0.52	0.05	1.6
benzo(ghi)perylene	mg/kg	LQM S4UL	360	3.32	0.21	8.37
indeno(123cd)pyrene	mg/kg	LQM S4UL	46	4.41	0.32	11



Concrete Classification Data Sheet (Soil)

Job Number:	31296	Maximum Water Soluble Sulphate:	30
Job Name:	Chorlton Irish Club, Cross Road, Chorlton	Minimum pH:	6.9
Site Class:	Brownfield	Design Sulphate Class:	DS-1
Water Table:	Static	ACEC Class:	AC-1s
Intended Working Life:	50 Years	Design Chemical Class:	DC-1

Sample ID	Depth Top	Depth Bottom	Date Sampled	Water Soluble Sulphate (mg/l)	pH
WS101	0.30	0.50	17-May-21	20	6.9
WS102	0.10	0.30	17-May-21	30	8.0
WS103	0.25	0.70	17-May-21	20	8.1
WS104	0.30	0.70	17-May-21	20	7.9
TP101	0.20	0.40	17-May-21	20	7.8
TP102	0.20	0.50	17-May-21	<10	7.2

Appendix F – Waste Classification Report

Waste Classification Report



GQSMP-SAY4K-7PUHR

Job name

31296 - Chorlton Irish Club

Description/Comments

Project

31296

Site

Chorlton Irish Club

Related Documents

#	Name	Description
None		

Waste Stream Template

Sutcliffe Suite 2 2021

Classified by

Name: **Daniel Evans**
Date: **28 May 2021 13:41 GMT**
Telephone: **0151 227 3155**
Company: **Sutcliffe Projects Ltd**
18-20 Harrington St
Liverpool
L2 9QA

HazWasteOnline™ Training Record:

Course	Date
Hazardous Waste Classification	-
Advanced Hazardous Waste Classification	-

Report

Created by: Daniel Evans
Created date: 28 May 2021 13:41 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	WS101	0.30-0.50	Hazardous	HP 3(i), HP 7, HP 11	2
2	WS102	0.10-0.30	Hazardous	HP 3(i), HP 7, HP 11	5
3	WS103	0.25-0.70	Non Hazardous		8
4	WS104	0.30-0.70	Hazardous	HP 3(i), HP 7, HP 11	11
5	TP101	0.20-0.40	Non Hazardous		14
6	TP102	0.20-0.50	Non Hazardous		17

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	20
Appendix B: Rationale for selection of metal species	21
Appendix C: Version	22

Classification of sample: WS101

 **Hazardous Waste**
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name:	LoW Code:
WS101	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.30-0.50 m	Entry:
Moisture content:	17 05 03 * (Soil and stones containing hazardous substances)
16.5%	
(no correction)	

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.146%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.146%)

Hazard properties (substances considered hazardous until shown otherwise)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.146%)

Determinands

Moisture content: **16.5%** No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
1	 arsenic { arsenic trioxide }				15 mg/kg	1.32	19.805 mg/kg	0.00198 %			
	033-003-00-0	215-481-4	1327-53-3								
2	 cadmium { cadmium oxide }				<0.5 mg/kg	1.142	<0.571 mg/kg	<0.0000571 %			<LOD
	048-002-00-0	215-146-2	1306-19-0								

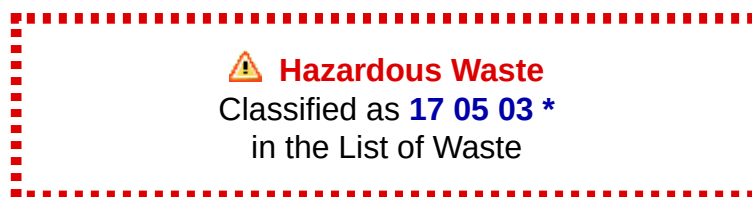
#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }	215-160-9	1308-38-9		20	mg/kg	1.462	29.231	mg/kg	0.00292 %		
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8			<1	mg/kg	2.27	<2.27	mg/kg	<0.000227 %		<LOD
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1	40	mg/kg	1.126	45.036	mg/kg	0.0045 %		
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	107	mg/kg	1.56	166.9	mg/kg	0.0107 %		
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7	4.8	mg/kg	1.353	6.497	mg/kg	0.00065 %		
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7	16	mg/kg	2.976	47.62	mg/kg	0.00476 %		
9	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5	<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
10	zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2	56	mg/kg	1.245	69.704	mg/kg	0.00697 %		
11	TPH (C6 to C40) petroleum group		TPH		1460	mg/kg		1460	mg/kg	0.146 %		
12	pH		PH		6.86	pH		6.86	pH	6.86 pH		
13	naphthalene	601-052-00-2	202-049-5	91-20-3	<0.3	mg/kg		<0.3	mg/kg	<0.00003 %		<LOD
14	acenaphthylene		205-917-1	208-96-8	0.17	mg/kg		0.17	mg/kg	0.000017 %		
15	acenaphthene		201-469-6	83-32-9	3.36	mg/kg		3.36	mg/kg	0.000336 %		
16	fluorene		201-695-5	86-73-7	3.32	mg/kg		3.32	mg/kg	0.000332 %		
17	phenanthrene		201-581-5	85-01-8	21	mg/kg		21	mg/kg	0.0021 %		
18	anthracene		204-371-1	120-12-7	9.51	mg/kg		9.51	mg/kg	0.000951 %		
19	fluoranthene		205-912-4	206-44-0	25.8	mg/kg		25.8	mg/kg	0.00258 %		
20	pyrene		204-927-3	129-00-0	20.8	mg/kg		20.8	mg/kg	0.00208 %		
21	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	8.82	mg/kg		8.82	mg/kg	0.000882 %		
22	chrysene	601-048-00-0	205-923-4	218-01-9	10.1	mg/kg		10.1	mg/kg	0.00101 %		
23	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	6.91	mg/kg		6.91	mg/kg	0.000691 %		
24	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	4.06	mg/kg		4.06	mg/kg	0.000406 %		
25	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	6.96	mg/kg		6.96	mg/kg	0.000696 %		
26	indeno[123-cd]pyrene		205-893-2	193-39-5	4.41	mg/kg		4.41	mg/kg	0.000441 %		
27	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.52	mg/kg		0.52	mg/kg	0.000052 %		
28	benzo[ghi]perylene		205-883-8	191-24-2	3.32	mg/kg		3.32	mg/kg	0.000332 %		
29	benzene	601-020-00-8	200-753-7	71-43-2	<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
30	toluene	601-021-00-3	203-625-9	108-88-3	<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
31	ethylbenzene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	601-023-00-4	202-849-4	100-41-4							
32	xylene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]							
33	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	603-181-00-X	216-653-1	1634-04-4							
Total:								0.192 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS102



Sample details

Sample Name:	LoW Code:	
WS102	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry:	17 05 03 * (Soil and stones containing hazardous substances)
0.10-0.30 m		
Moisture content:		
8.8%		
(no correction)		

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.114%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.114%)

Hazard properties (substances considered hazardous until shown otherwise)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.114%)

Determinands

Moisture content: **8.8%** No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
1	 arsenic { arsenic trioxide }				15 mg/kg	1.32	19.805 mg/kg	0.00198 %		
	033-003-00-0	215-481-4	1327-53-3							
2	 cadmium { cadmium oxide }				0.7 mg/kg	1.142	0.8 mg/kg	0.00008 %		
	048-002-00-0	215-146-2	1306-19-0							

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }	215-160-9	1308-38-9		24	mg/kg	1.462	35.077	mg/kg	0.00351 %		
4	chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8			<1	mg/kg	2.27	<2.27	mg/kg	<0.000227 %		<LOD
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1	46	mg/kg	1.126	51.791	mg/kg	0.00518 %		
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	42	mg/kg	1.56	65.512	mg/kg	0.0042 %		
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7	0.31	mg/kg	1.353	0.42	mg/kg	0.000042 %		
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7	49	mg/kg	2.976	145.837	mg/kg	0.0146 %		
9	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5	<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
10	zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2	69	mg/kg	1.245	85.885	mg/kg	0.00859 %		
11	TPH (C6 to C40) petroleum group			TPH	1140	mg/kg		1140	mg/kg	0.114 %		
12	pH			PH	8.03	pH		8.03	pH	8.03 pH		
13	naphthalene	601-052-00-2	202-049-5	91-20-3	<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
14	acenaphthylene		205-917-1	208-96-8	0.23	mg/kg		0.23	mg/kg	0.000023 %		
15	acenaphthene		201-469-6	83-32-9	0.35	mg/kg		0.35	mg/kg	0.000035 %		
16	fluorene		201-695-5	86-73-7	0.07	mg/kg		0.07	mg/kg	0.000007 %		
17	phenanthrene		201-581-5	85-01-8	0.45	mg/kg		0.45	mg/kg	0.000045 %		
18	anthracene		204-371-1	120-12-7	0.27	mg/kg		0.27	mg/kg	0.000027 %		
19	fluoranthene		205-912-4	206-44-0	1.57	mg/kg		1.57	mg/kg	0.000157 %		
20	pyrene		204-927-3	129-00-0	1.63	mg/kg		1.63	mg/kg	0.000163 %		
21	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	0.76	mg/kg		0.76	mg/kg	0.000076 %		
22	chrysene	601-048-00-0	205-923-4	218-01-9	0.73	mg/kg		0.73	mg/kg	0.000073 %		
23	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	0.54	mg/kg		0.54	mg/kg	0.000054 %		
24	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	0.16	mg/kg		0.16	mg/kg	0.000016 %		
25	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	0.53	mg/kg		0.53	mg/kg	0.000053 %		
26	indeno[123-cd]pyrene		205-893-2	193-39-5	0.32	mg/kg		0.32	mg/kg	0.000032 %		
27	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.05	mg/kg		0.05	mg/kg	0.000005 %		
28	benzo[ghi]perylene		205-883-8	191-24-2	0.21	mg/kg		0.21	mg/kg	0.000021 %		
29	benzene	601-020-00-8	200-753-7	71-43-2	<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
30	toluene	601-021-00-3	203-625-9	108-88-3	<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
31	ethylbenzene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	601-023-00-4	202-849-4	100-41-4							
32	xylene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]							
33	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	603-181-00-X	216-653-1	1634-04-4							
Total:								0.153 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS103

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
WS103	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.25-0.70 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
16.2%	
(no correction)	

Hazard properties

None identified

Determinands

Moisture content: **16.2%** No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
1	arsenic { arsenic trioxide }				12 mg/kg	1.32	15.844 mg/kg	0.00158 %			
	033-003-00-0	215-481-4	1327-53-3								
2	cadmium { cadmium oxide }				<0.5 mg/kg	1.142	<0.571 mg/kg	<0.0000571 %			<LOD
	048-002-00-0	215-146-2	1306-19-0								
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				23 mg/kg	1.462	33.616 mg/kg	0.00336 %			
		215-160-9	1308-38-9								
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<1 mg/kg	2.27	<2.27 mg/kg	<0.000227 %			<LOD
	024-017-00-8										
5	copper { dicopper oxide; copper (I) oxide }				39 mg/kg	1.126	43.91 mg/kg	0.00439 %			
	029-002-00-X	215-270-7	1317-39-1								
6	lead { lead chromate }			1	666 mg/kg	1.56	1038.837 mg/kg	0.0666 %			
	082-004-00-2	231-846-0	7758-97-6								
7	mercury { mercury dichloride }				1.89 mg/kg	1.353	2.558 mg/kg	0.000256 %			
	080-010-00-X	231-299-8	7487-94-7								
8	nickel { nickel chromate }				20 mg/kg	2.976	59.525 mg/kg	0.00595 %			
	028-035-00-7	238-766-5	14721-18-7								
9	selenium { nickel selenate }				<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %			<LOD
	028-031-00-5	239-125-2	15060-62-5								
10	zinc { zinc oxide }				84 mg/kg	1.245	104.556 mg/kg	0.0105 %			
	030-013-00-7	215-222-5	1314-13-2								
11	TPH (C6 to C40) petroleum group				414 mg/kg		414 mg/kg	0.0414 %			
			TPH								
12	pH				8.12 pH		8.12 pH	8.12 pH			
			PH								
13	naphthalene				63.6 mg/kg		63.6 mg/kg	0.00636 %			
	601-052-00-2	202-049-5	91-20-3								
14	acenaphthylene				0.44 mg/kg		0.44 mg/kg	0.000044 %			
		205-917-1	208-96-8								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
15	acenaphthene	201-469-6	83-32-9		67.4 mg/kg		67.4 mg/kg	0.00674 %			
16	fluorene	201-695-5	86-73-7		47.9 mg/kg		47.9 mg/kg	0.00479 %			
17	phenanthrene	201-581-5	85-01-8		182 mg/kg		182 mg/kg	0.0182 %			
18	anthracene	204-371-1	120-12-7		34 mg/kg		34 mg/kg	0.0034 %			
19	fluoranthene	205-912-4	206-44-0		97.3 mg/kg		97.3 mg/kg	0.00973 %			
20	pyrene	204-927-3	129-00-0		75.2 mg/kg		75.2 mg/kg	0.00752 %			
21	benzo[a]anthracene	601-033-00-9	200-280-6		30.7 mg/kg		30.7 mg/kg	0.00307 %			
22	chrysene	601-048-00-0	205-923-4		36.9 mg/kg		36.9 mg/kg	0.00369 %			
23	benzo[b]fluoranthene	601-034-00-4	205-911-9		22.2 mg/kg		22.2 mg/kg	0.00222 %			
24	benzo[k]fluoranthene	601-036-00-5	205-916-6		9.84 mg/kg		9.84 mg/kg	0.000984 %			
25	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		19.4 mg/kg		19.4 mg/kg	0.00194 %			
26	indeno[123-cd]pyrene	205-893-2	193-39-5		11 mg/kg		11 mg/kg	0.0011 %			
27	dibenz[a,h]anthracene	601-041-00-2	200-181-8		1.6 mg/kg		1.6 mg/kg	0.00016 %			
28	benzo[ghi]perylene	205-883-8	191-24-2		8.37 mg/kg		8.37 mg/kg	0.000837 %			
29	benzene	601-020-00-8	200-753-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
30	toluene	601-021-00-3	203-625-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
31	ethylbenzene	601-023-00-4	202-849-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
32	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]		0.03 mg/kg		0.03 mg/kg	0.000003 %			
33	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
Total:									0.205 %		

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- Determinand defined or amended by HazWasteOnline (see Appendix A)
- Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- <LOD Below limit of detection
- ND Not detected
- CLP: Note 1 Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations too low to be considered a flammable risk.

Hazard Statements hit:

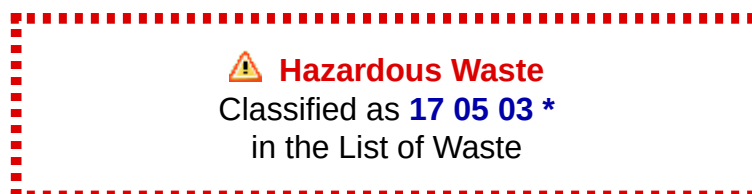
Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinands:

TPH (C6 to C40) petroleum group: (conc.: 0.0414%)

xylene: (conc.: 3.0e-06%)

Classification of sample: WS104



Sample details

Sample Name:	LoW Code:	
WS104	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry:	17 05 03 * (Soil and stones containing hazardous substances)
0.30-0.70 m		
Moisture content:		
14.8%		
(no correction)		

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.104%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.104%)

Hazard properties (substances considered hazardous until shown otherwise)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.104%)

Determinands

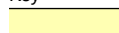
Moisture content: **14.8%** No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
1	 arsenic { arsenic trioxide }				12 mg/kg	1.32	15.844 mg/kg	0.00158 %		
	033-003-00-0	215-481-4	1327-53-3							
2	 cadmium { cadmium oxide }				0.8 mg/kg	1.142	0.914 mg/kg	0.0000914 %		
	048-002-00-0	215-146-2	1306-19-0							

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }	215-160-9	1308-38-9		15	mg/kg	1.462	21.923	mg/kg	0.00219 %		
4	chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8			<1	mg/kg	2.27	<2.27	mg/kg	<0.000227 %		<LOD
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1	119	mg/kg	1.126	133.981	mg/kg	0.0134 %		
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	209	mg/kg	1.56	326.001	mg/kg	0.0209 %		
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7	2.42	mg/kg	1.353	3.275	mg/kg	0.000328 %		
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7	23	mg/kg	2.976	68.454	mg/kg	0.00685 %		
9	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5	<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
10	zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2	201	mg/kg	1.245	250.188	mg/kg	0.025 %		
11	TPH (C6 to C40) petroleum group			TPH	1040	mg/kg		1040	mg/kg	0.104 %		
12	pH			PH	7.88	pH		7.88	pH	7.88 pH		
13	naphthalene	601-052-00-2	202-049-5	91-20-3	0.15	mg/kg		0.15	mg/kg	0.000015 %		
14	acenaphthylene		205-917-1	208-96-8	0.34	mg/kg		0.34	mg/kg	0.000034 %		
15	acenaphthene		201-469-6	83-32-9	0.49	mg/kg		0.49	mg/kg	0.000049 %		
16	fluorene		201-695-5	86-73-7	0.41	mg/kg		0.41	mg/kg	0.000041 %		
17	phenanthrene		201-581-5	85-01-8	3.53	mg/kg		3.53	mg/kg	0.000353 %		
18	anthracene		204-371-1	120-12-7	2.26	mg/kg		2.26	mg/kg	0.000226 %		
19	fluoranthene		205-912-4	206-44-0	17.7	mg/kg		17.7	mg/kg	0.00177 %		
20	pyrene		204-927-3	129-00-0	18.4	mg/kg		18.4	mg/kg	0.00184 %		
21	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	13.6	mg/kg		13.6	mg/kg	0.00136 %		
22	chrysene	601-048-00-0	205-923-4	218-01-9	10	mg/kg		10	mg/kg	0.001 %		
23	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	9.65	mg/kg		9.65	mg/kg	0.000965 %		
24	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	3.91	mg/kg		3.91	mg/kg	0.000391 %		
25	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	9.86	mg/kg		9.86	mg/kg	0.000986 %		
26	indeno[123-cd]pyrene		205-893-2	193-39-5	6.66	mg/kg		6.66	mg/kg	0.000666 %		
27	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	1.2	mg/kg		1.2	mg/kg	0.00012 %		
28	benzo[ghi]perylene		205-883-8	191-24-2	4.41	mg/kg		4.41	mg/kg	0.000441 %		
29	benzene	601-020-00-8	200-753-7	71-43-2	<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
30	toluene	601-021-00-3	203-625-9	108-88-3	<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number							
31	ethylbenzene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	601-023-00-4	202-849-4	100-41-4							
32	xylene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]							
33	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	603-181-00-X	216-653-1	1634-04-4							
Total:								0.185 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP101

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
TP101	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.20-0.40 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
13.5%	
(no correction)	

Hazard properties

None identified

Determinands

Moisture content: **13.5%** No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
1	arsenic { arsenic trioxide }				23	mg/kg	1.32	30.367	mg/kg	0.00304 %		
	033-003-00-0	215-481-4	1327-53-3									
2	cadmium { cadmium oxide }				0.6	mg/kg	1.142	0.685	mg/kg	0.0000685 %		
	048-002-00-0	215-146-2	1306-19-0									
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				20	mg/kg	1.462	29.231	mg/kg	0.00292 %		
		215-160-9	1308-38-9									
4	chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<1	mg/kg	2.27	<2.27	mg/kg	<0.000227 %		<LOD
	024-017-00-8											
5	copper { dicopper oxide; copper (I) oxide }				57	mg/kg	1.126	64.176	mg/kg	0.00642 %		
	029-002-00-X	215-270-7	1317-39-1									
6	lead { lead chromate }			1	150	mg/kg	1.56	233.972	mg/kg	0.015 %		
	082-004-00-2	231-846-0	7758-97-6									
7	mercury { mercury dichloride }				2.81	mg/kg	1.353	3.803	mg/kg	0.00038 %		
	080-010-00-X	231-299-8	7487-94-7									
8	nickel { nickel chromate }				39	mg/kg	2.976	116.074	mg/kg	0.0116 %		
	028-035-00-7	238-766-5	14721-18-7									
9	selenium { nickel selenate }				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
	028-031-00-5	239-125-2	15060-62-5									
10	zinc { zinc oxide }				85	mg/kg	1.245	105.801	mg/kg	0.0106 %		
	030-013-00-7	215-222-5	1314-13-2									
11	TPH (C6 to C40) petroleum group				237	mg/kg		237	mg/kg	0.0237 %		
			TPH									
12	pH				7.83	pH		7.83	pH	7.83 pH		
			pH									
13	naphthalene				0.12	mg/kg		0.12	mg/kg	0.000012 %		
	601-052-00-2	202-049-5	91-20-3									
14	acenaphthylene				0.17	mg/kg		0.17	mg/kg	0.000017 %		
		205-917-1	208-96-8									

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
15	acenaphthene	201-469-6	83-32-9		2.09 mg/kg		2.09 mg/kg	0.000209 %			
16	fluorene	201-695-5	86-73-7		2.17 mg/kg		2.17 mg/kg	0.000217 %			
17	phenanthrene	201-581-5	85-01-8		15.3 mg/kg		15.3 mg/kg	0.00153 %			
18	anthracene	204-371-1	120-12-7		7 mg/kg		7 mg/kg	0.0007 %			
19	fluoranthene	205-912-4	206-44-0		17.1 mg/kg		17.1 mg/kg	0.00171 %			
20	pyrene	204-927-3	129-00-0		13.3 mg/kg		13.3 mg/kg	0.00133 %			
21	benzo[a]anthracene	601-033-00-9	200-280-6		7.04 mg/kg		7.04 mg/kg	0.000704 %			
22	chrysene	601-048-00-0	205-923-4		4.7 mg/kg		4.7 mg/kg	0.00047 %			
23	benzo[b]fluoranthene	601-034-00-4	205-911-9		3.92 mg/kg		3.92 mg/kg	0.000392 %			
24	benzo[k]fluoranthene	601-036-00-5	205-916-6		1.55 mg/kg		1.55 mg/kg	0.000155 %			
25	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		3.84 mg/kg		3.84 mg/kg	0.000384 %			
26	indeno[123-cd]pyrene	205-893-2	193-39-5		2.19 mg/kg		2.19 mg/kg	0.000219 %			
27	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.36 mg/kg		0.36 mg/kg	0.000036 %			
28	benzo[ghi]perylene	205-883-8	191-24-2		1.46 mg/kg		1.46 mg/kg	0.000146 %			
29	benzene	601-020-00-8	200-753-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
30	toluene	601-021-00-3	203-625-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
31	ethylbenzene	601-023-00-4	202-849-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
32	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
33	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
Total:									0.0824 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1 Only the metal concentration has been used for classification	

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations too low to be considered a flammable risk.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0237%)

Classification of sample: TP102

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:	
TP102	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.20-0.50 m		
Moisture content:		
18.6%		
(no correction)		

Hazard properties

None identified

Determinands

Moisture content: 18.6% No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
1	arsenic { arsenic trioxide }				11	mg/kg	1.32	14.524	mg/kg	0.00145 %		
	033-003-00-0	215-481-4	1327-53-3									
2	cadmium { cadmium oxide }				<0.5	mg/kg	1.142	<0.571	mg/kg	<0.0000571 %		<LOD
	048-002-00-0	215-146-2	1306-19-0									
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				14	mg/kg	1.462	20.462	mg/kg	0.00205 %		
		215-160-9	1308-38-9									
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<1	mg/kg	2.27	<2.27	mg/kg	<0.000227 %		<LOD
	024-017-00-8											
5	copper { dicopper oxide; copper (I) oxide }				47	mg/kg	1.126	52.917	mg/kg	0.00529 %		
	029-002-00-X	215-270-7	1317-39-1									
6	lead { lead chromate }			1	76	mg/kg	1.56	118.546	mg/kg	0.0076 %		
	082-004-00-2	231-846-0	7758-97-6									
7	mercury { mercury dichloride }				2.67	mg/kg	1.353	3.614	mg/kg	0.000361 %		
	080-010-00-X	231-299-8	7487-94-7									
8	nickel { nickel chromate }				15	mg/kg	2.976	44.644	mg/kg	0.00446 %		
	028-035-00-7	238-766-5	14721-18-7									
9	selenium { nickel selenate }				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
	028-031-00-5	239-125-2	15060-62-5									
10	zinc { zinc oxide }				51	mg/kg	1.245	63.48	mg/kg	0.00635 %		
	030-013-00-7	215-222-5	1314-13-2									
11	TPH (C6 to C40) petroleum group				638	mg/kg		638	mg/kg	0.0638 %		
			TPH									
12	pH				7.22	pH		7.22	pH	7.22 pH		
			PH									
13	naphthalene				0.77	mg/kg		0.77	mg/kg	0.000077 %		
	601-052-00-2	202-049-5	91-20-3									
14	acenaphthylene				0.07	mg/kg		0.07	mg/kg	0.000007 %		
		205-917-1	208-96-8									

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
15	acenaphthene	201-469-6	83-32-9		2.22 mg/kg		2.22 mg/kg	0.000222 %			
16	fluorene	201-695-5	86-73-7		1.37 mg/kg		1.37 mg/kg	0.000137 %			
17	phenanthrene	201-581-5	85-01-8		6.22 mg/kg		6.22 mg/kg	0.000622 %			
18	anthracene	204-371-1	120-12-7		1.62 mg/kg		1.62 mg/kg	0.000162 %			
19	fluoranthene	205-912-4	206-44-0		11.8 mg/kg		11.8 mg/kg	0.00118 %			
20	pyrene	204-927-3	129-00-0		11 mg/kg		11 mg/kg	0.0011 %			
21	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	4.78 mg/kg		4.78 mg/kg	0.000478 %			
22	chrysene	601-048-00-0	205-923-4	218-01-9	3.92 mg/kg		3.92 mg/kg	0.000392 %			
23	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	4.9 mg/kg		4.9 mg/kg	0.00049 %			
24	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	1.7 mg/kg		1.7 mg/kg	0.00017 %			
25	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	4.79 mg/kg		4.79 mg/kg	0.000479 %			
26	indeno[123-cd]pyrene	205-893-2	193-39-5		2.96 mg/kg		2.96 mg/kg	0.000296 %			
27	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.48 mg/kg		0.48 mg/kg	0.000048 %			
28	benzo[ghi]perylene	205-883-8	191-24-2		2.06 mg/kg		2.06 mg/kg	0.000206 %			
29	benzene	601-020-00-8	200-753-7	71-43-2	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
30	toluene	601-021-00-3	203-625-9	108-88-3	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
31	ethylbenzene	601-023-00-4	202-849-4	100-41-4	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
32	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
33	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
Total:									0.098 %		

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- Determinand defined or amended by HazWasteOnline (see Appendix A)
- Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- <LOD Below limit of detection
- ND Not detected
- CLP: Note 1 Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and ≤ 75°C"

Force this Hazardous property to non hazardous because Concentrations too low to be considered a flammable risk.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0638%)

Appendix A: Classifier defined and non CLP determinands

- **chromium(III) oxide (worst case)** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database

Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4 H332 , Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Resp. Sens. 1 H334 , Skin Sens. 1 H317 , Repr. 1B H360FD , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: Flam. Liq. 3 H226 , Asp. Tox. 1 H304 , STOT RE 2 H373 , Muta. 1B H340 , Carc. 1B H350 , Repr. 2 H361d , Aquatic Chronic 2 H411

- **pH** (CAS Number: PH)

Description/Comments: Appendix C4

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: None.

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4 H302 , Acute Tox. 1 H330 , Acute Tox. 1 H310 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Aquatic Chronic 2 H411

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Carc. 2 H351 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Skin Irrit. 2 H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Acute Tox. 4 H302 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

▪ **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Skin Irrit. 2 H315 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

▪ **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Carc. 2 H351

▪ **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 23 Jul 2015

Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

▪ **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4

Description/Comments:

Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)

Additional Hazard Statement(s): Carc. 2 H351

Reason for additional Hazards Statement(s):

03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worst case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc oxide}

Most probable compound.

Appendix C: Version

HazWasteOnline Classification Engine: **WM3 1st Edition v1.1, May 2018**

HazWasteOnline Classification Engine Version: 2021.138.4779.9121 (18 May 2021)

HazWasteOnline Database: 2021.138.4779.9121 (18 May 2021)

This classification utilises the following guidance and legislation:

WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018

CLP Regulation - Regulation 1272/2008/EC of 16 December 2008

1st ATP - Regulation 790/2009/EC of 10 August 2009

2nd ATP - Regulation 286/2011/EC of 10 March 2011

3rd ATP - Regulation 618/2012/EU of 10 July 2012

4th ATP - Regulation 487/2013/EU of 8 May 2013

Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

5th ATP - Regulation 944/2013/EU of 2 October 2013

6th ATP - Regulation 605/2014/EU of 5 June 2014

WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014

7th ATP - Regulation 2015/1221/EU of 24 July 2015

8th ATP - Regulation (EU) 2016/918 of 19 May 2016

9th ATP - Regulation (EU) 2016/1179 of 19 July 2016

10th ATP - Regulation (EU) 2017/776 of 4 May 2017

HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017

13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

14th ATP - Regulation (EU) 2020/217 of 4 October 2019

15th ATP - Regulation (EU) 2020/1182 of 19 May 2020

The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)

Regulations 2019 - UK: 2019 No. 720 of 27th March 2019

The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)

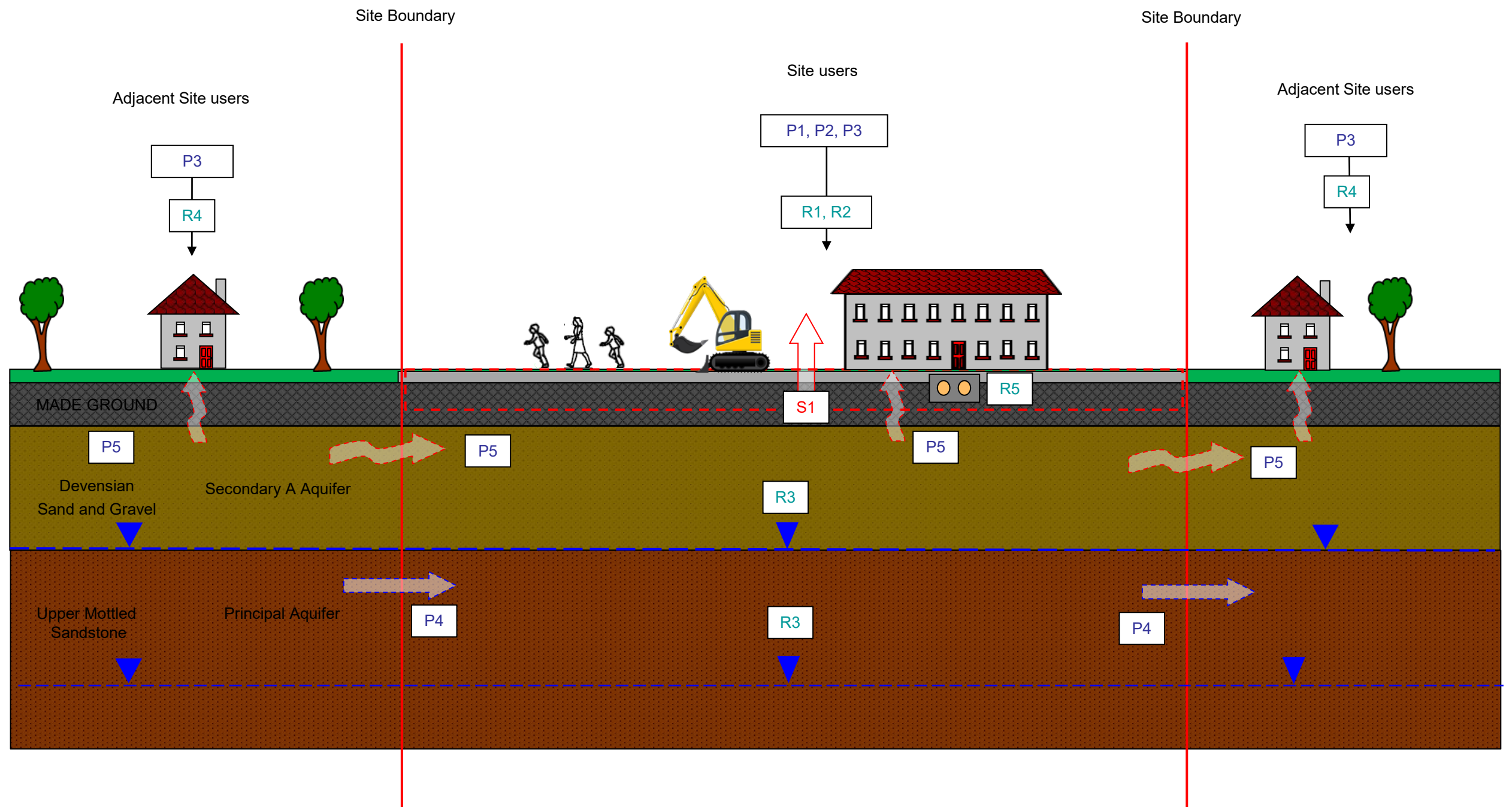
Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK:

2020 No. 1540 of 16th December 2020

POPs Regulation 2019 - Regulation (EU) 2019/1021 of 20 June 2019

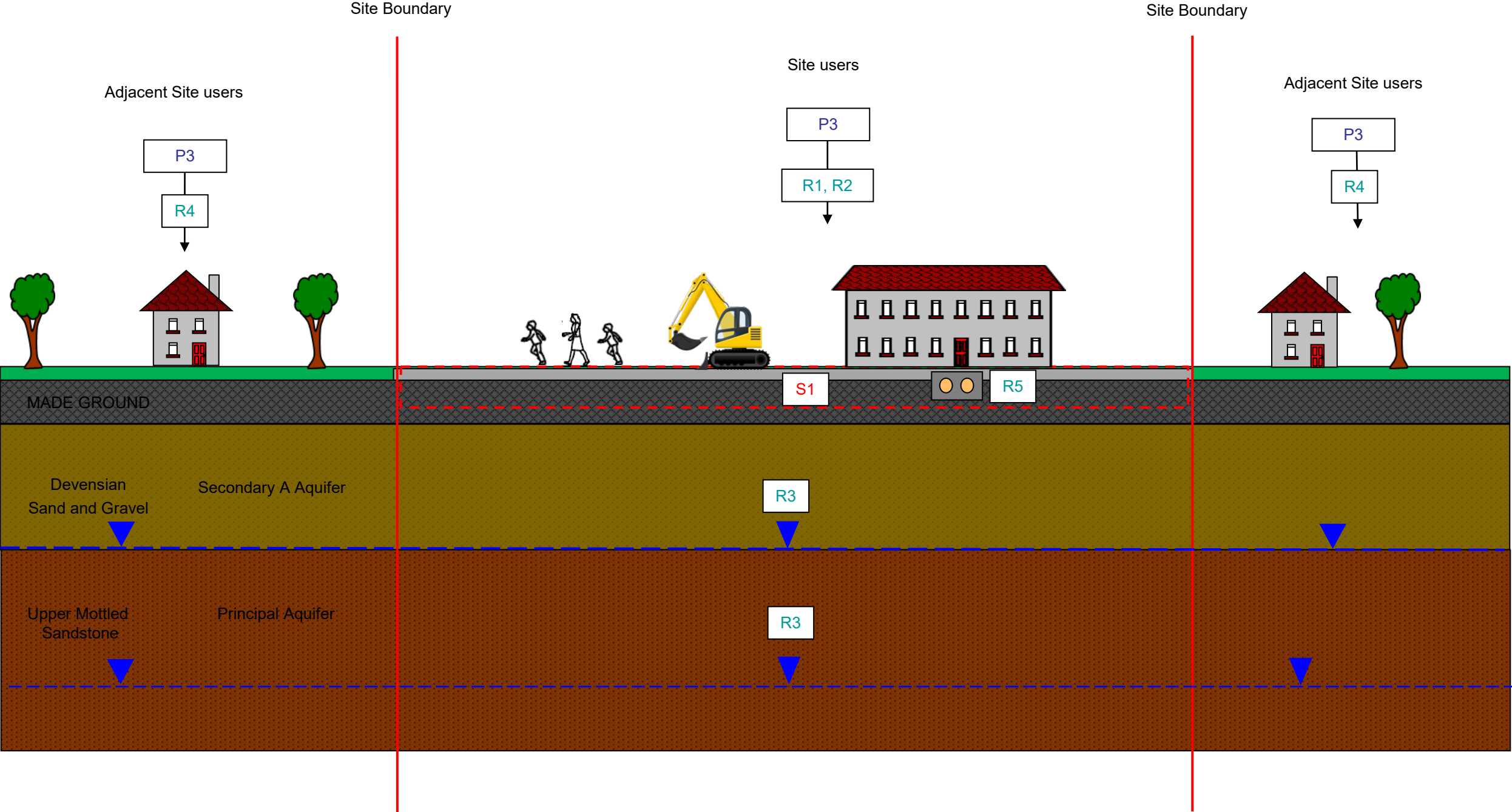
Figure 3: Preliminary Conceptual Model



Key	
S1 – Potentially Contaminated Soil - Onsite	
R1 Future site Users	
R2 Construction Workers	
R3 Controlled waters	
R4 Adjacent Site Users	
R5 Infrastructure & Buried services	
P1 Direct Contact	
P2 Ingestion	
P3 Inhalation	
P4 Leaching & Migration	
P5 Vertical & lateral migration of ground gas	
	Ground gas migration
	Leachate migration
	Direct contact/ ingestion
	Underground Infrastructure

	Client: Southway Homes Trust		
	Project: Chorlton Irish Club, Cross Road		
	Title: Preliminary Conceptual Site Model (CSM)		
Purpose: Report	Draft		Scale (at A3)
	Issue	1	Not to scale
Issuing Office: Liverpool	Drawing number		Version A
Telephone: 0151 227 3155			

Figure 5: Revised Conceptual Model



Key

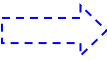
S1 – Made Ground - Onsite

R1 Future site Users
R2 Construction Workers
R3 Controlled waters
R4 Adjacent Site Users
R5 Infrastructure & Buried services

P1 Direct Contact
P2 Ingestion
P3 Inhalation
P4 Leaching & Migration
P5 Vertical & lateral migration of ground gas



Ground gas migration



Leachate migration



Direct contact/ ingestion

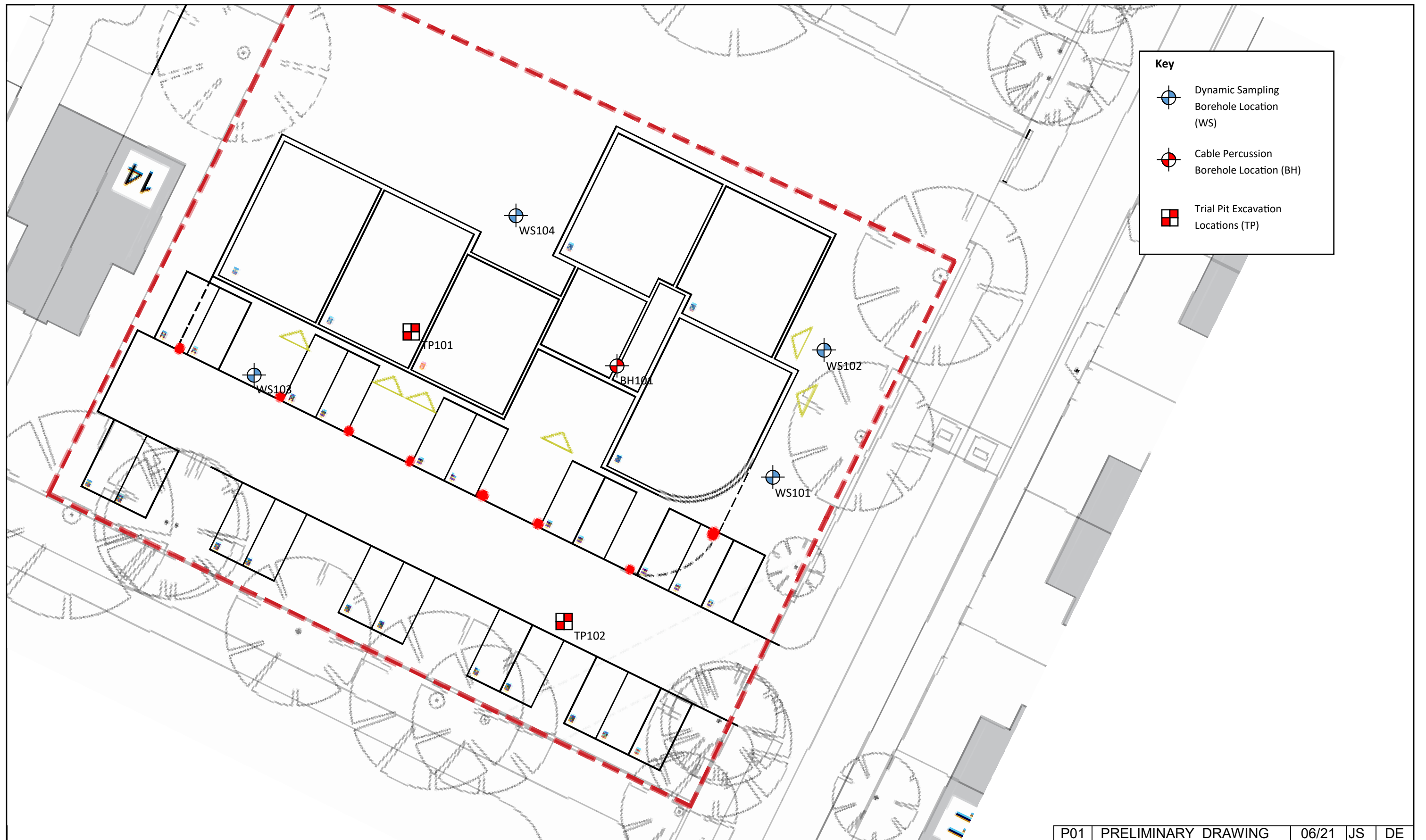


Underground Infrastructure

	Client: Southway Homes Trust		
	Project: Chorlton Irish Club, Cross Road		
	Title: Revised Conceptual Site Model (CSM)		
Purpose: Report	Draft		Scale (at A3)
	Issue	1	Not to scale
Issuing Office: Liverpool	Drawing number		Version A
Telephone: 0151 227 3155			

Drawing No: *31296-SUT-ZZ-00-DR-G-720-0001* – Site Investigation on Existing Layout

Drawing No: 31296-SUT-ZZ-00-DR-G-720-0002 – Site Investigation on Proposed Layout



P01	PRELIMINARY DRAWING	06/21	JS	DE
Rev	Description	Date	By	Chkd
Date June 2021	Drawn By J Smith	Checked By DE		
Scale at A3 NTS		Project Number 31296LG		
Sheet Number 31296-SUT-ZZ-OO-DR-G-720-0002				Revision P01